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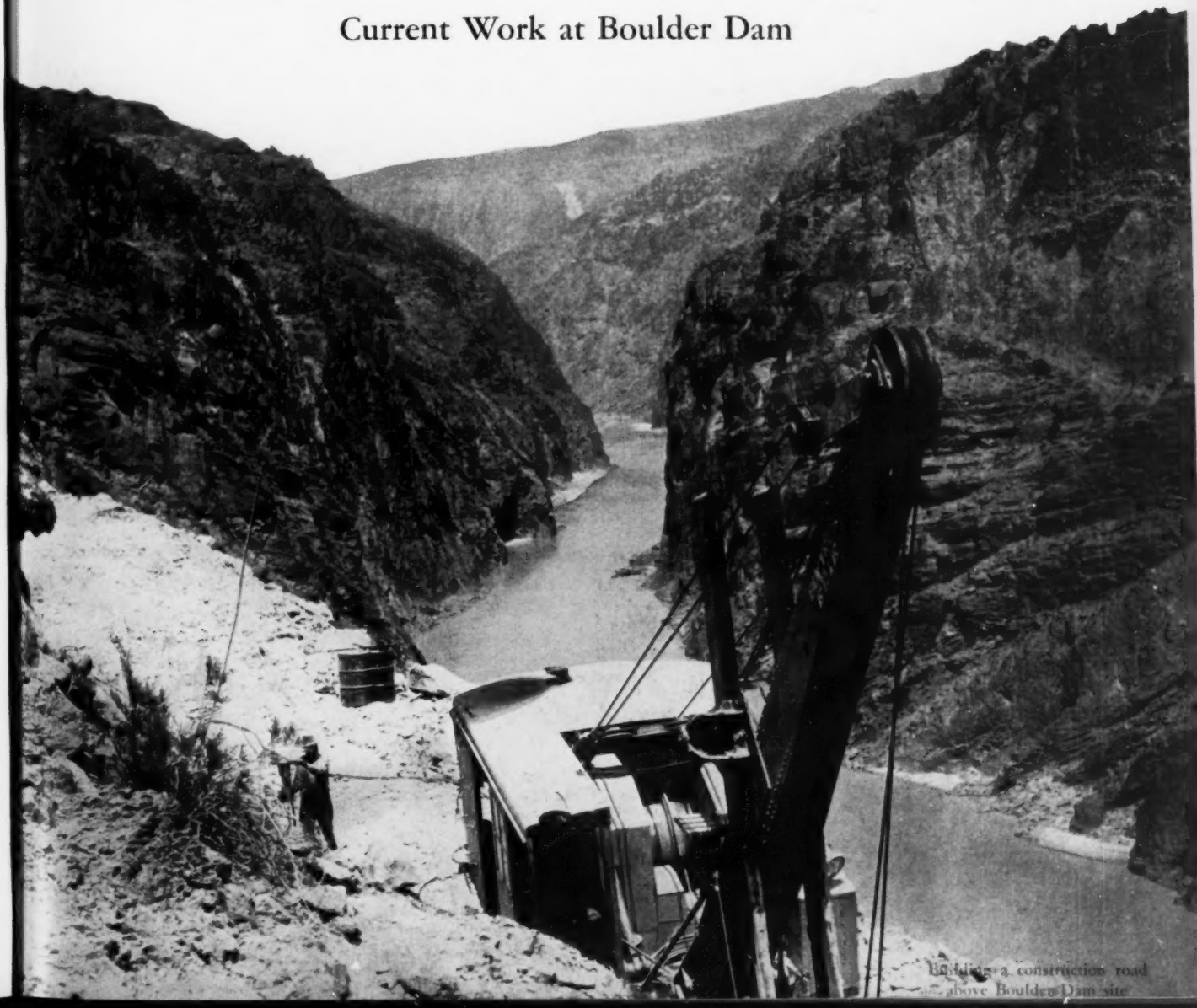
Engineering News-Record

May 28, 1931

Structural Features of Golden Gate Bridge

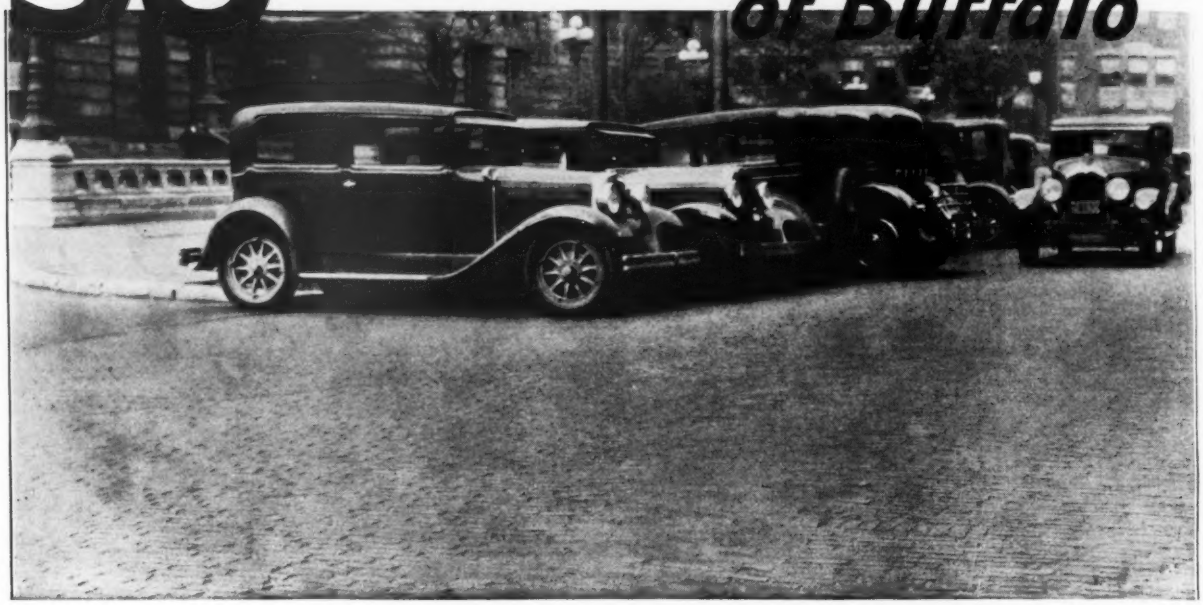
Imhoff on Water-Sewage-Water Cycle
Lightweight Precast Bridge Floor Slabs
Continuous Algae Control by Chlorination
Arbitration and Contractual Disputes
Stabilization of Construction Activities
Drainage Works for New Madrid Floodway

Current Work at Boulder Dam



Building a construction road above Boulder Dam site

38 Years *In the Heart of Buffalo*



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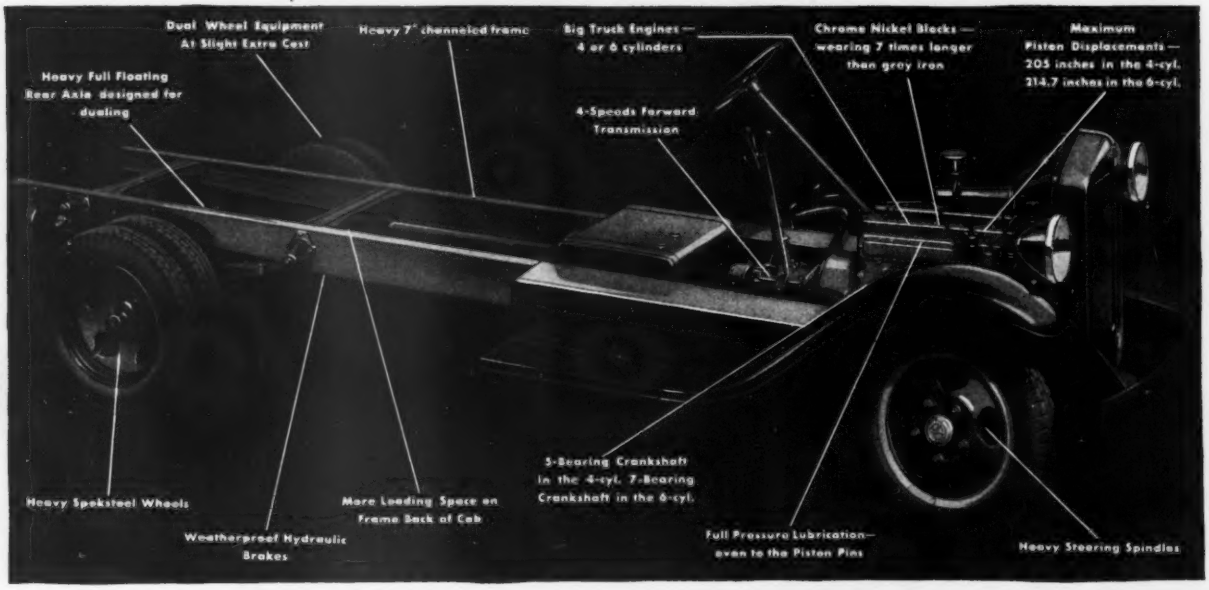
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ENGINEERING NEWS-RECORD

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DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

F. E. SCHMITT, *Editor*

Volume 106 NEW YORK, MAY 28, 1931 Number 22

Business Courage

ONE of the brightest signs of recent months appeared Thursday, when the Eastern railroad presidents gave an unexpected exhibition of business courage. They decided that, since revenues are insufficient to make ends meet, they would apply for an increase in freight rates. This decision embodies the spirit needed in every industry just now: a determination not to do business below cost. In the case of the railroads, curtailment of betterments and even neglect of maintenance have not equalized the decrease of income, and it has come to be a hard struggle to pay bond interest. Further decrease means attempts at wage reductions or bankruptcy, for few railroads have stored up surpluses to carry them over this period of lean traffic. At present they are giving service at or below cost, which spells danger to general business as much as to the railroads themselves. The deflation movement and the shrinkage in business which it brings about feed on price scales that are below cost. If the railroads will act on their announced intention, and if every other industry will set up a firm policy of no wage cutting and no prices below cost, the downward forces can soon be overcome.

Further Evidence

EVEN stronger proof that business courage based on a sane outlook is making its voice heard was given on the day after the railroad presidents' meeting when James A. Farrell, president of the United States Steel Corporation, told his brother steelmakers some homely truths about wages and prices. And in passing he illustrated the effect of price disorganization on general business when he related that his company has shut down on all furniture replacement for the current year as a necessary economy measure. He spoke of wage cutting, and his bitter protest against this practice was the sharpest reply yet made to the persistent attacks on wage standards that bankers and their followers have been conducting. Coming then to the subject of prices, Mr. Farrell said many strong things against price cutting without regard to costs, and against price chiseling by buyers. Two passages from his speech may serve to bring out his thought, however incompletely: "It is not honest for us to go on and sell our goods below cost of production and deprive our stockholders and our workmen of what they are entitled to." . . . "We ought to get fair prices and we have got to make up our minds that the principal factor in the situation is resistance to unfair buyers." His appropriate word "honest" gives the clue to better business practice; we need more courageous honesty in industry, and in this respect Mr. Farrell's indictment of the steel industry holds for most of industry and business: "We are not doing a good job." But with the railroads and steel leading the way, the country is on the way to do a better job.

Not a Side Issue

THE extent of the collateral work in constructing the diversion floodways of the adopted flood-control plan for the Mississippi River has received scant notice in the turmoil of battling over the major hydraulic, economic and design problems of these great emergency waterways. Yet, though overshadowed by the main floodway structures, these collateral works are in no sense of minor magnitude. For the New Madrid floodway, the drainage and bridge work described in this issue will cost half a million dollars, or one-seventh of the total cost of floodway construction. It includes some of the largest ditch sections, culverts and crossings recorded in modern land-drainage operations. At Bonnet Carré, the only other of the planned floodways that has been put under construction, crossings for railways and roads will involve the expenditure of several millions; their number, type and magnitude are at present a subject of dispute between the federal government and the state and private interests involved. The very nature of a diversion floodway interrupts the normal functioning of nature and life far outside as well as within its boundaries. This ability and privilege must in fairness be restored or compensation made for taking them away. A striking illustration of what restoration means is presented by the New Madrid floodway operations; a more notable illustration is likely to be offered by the final plans for the Bonnet Carré crossings.

Better Freight Transportation

STORE-DOOR delivery by railroads as a means of meeting truck competition is slowly winning acceptance by the companies themselves. Their recent acceptance of the principle as the basis for a plan to be worked out for New York should mark a turning point in a movement that has appeared inevitable to many observers. Some highly conservative railroad officials have long opposed extending railroad service beyond the end of the rails, whereas progressive thinkers in the railroad field have been urging expansion of railroad service to complete transportation service from shipper to receiver. It is their idea that the transporting agency should take freight from the shipper's door and move it to its destination by the most expeditious or most economical means, whether truck, truck-and-train, or even a truck-train-barge combination where the latter has the advantage.

Substitution of trucks for branch-line trains, and adoption of trucks for station-to-station way-freight service on busy main lines, were the first steps in this direction. Store-door delivery from rail terminals is the next. It will be followed by integration of rail, truck and barge lines if our transportation system is to develop to its fullest efficiency.

Container Cars

CLOSELY related to the subject of store-door delivery by the railroads as a means of meeting truck competition is extension of the use of container cars for less-than-carload freight shipments. Unit containers—loaded five or six to the car—have been used for some time by the Lehigh Valley, the New York Central and the Pennsylvania in the eastern region. Recently the Interstate Commerce Commission authorized the establishment of a similar service in the Southwest. A related service is being considered by the Pennsylvania in which freight is loaded into demountable truck bodies at the shipper's door and is delivered similarly. Both types of service have much to commend them, for, except in the case of very large manufacturing plants or favorably located smaller ones, it is not feasible to load shipments directly into railroad cars. Trucks must be used for the first or final movement or both. This condition has led to the use of trucks for the entire movement. On the other hand long hauling by truck is not as economical as by rail. At some indefinite point, depending upon the commodity, a change from truck to train becomes desirable. The use of unit containers and demountable truck bodies to eliminate much costly transshipping and thus broaden the usefulness of both railroads and trucks is a commendable advance toward unified transportation.

Water to Sewage to Water

CAN sewage be reconverted into good water? Yes, says Dr. Karl Imhoff, and supports his statement with the story of the Ruhr River water used three times in succession during last summer's dry weather. But the process cannot go on without end, and therefore water places a limit on population growth. Recently R. F. Goudey foretold that the growth of Los Angeles must end in fifty years because of water limitation under present sources (*ENR*, March 12, 1931, p. 443). Mr. Goudey's dramatic picture is made more definite by Dr. Imhoff's experiments that shows a possible ten cycles, but no more, as salt concentration reaches the limit of toleration. European sewage is strong; the weaker American sewage would probably permit twenty or thirty cycles. We have little need to look forward to such cyclic use, however. For, while it is true that the not uncommon use of sewage-polluted streams for water supply presents the same problem; that for a quarter century the Chicago stockyards polluted Bubbly Creek, filtered and chlorinated it and made it into potable water; and that many a sewage effluent in Massachusetts emerges so pure that the attendants drink it; any possibility of our deliberately applying the sewage-water conversion is too remote to be considered. Yet the experiment demonstrates the power of modern water-treatment processes. After all, sewage is but H_2O with an infinitesimal amount of deleterious materials. Chemically and bacterially there is no reason why these substances cannot be removed and the carrier used many times. Nature uncontrolled does it for us, and we now know that we can do it as well under control.

No Industry

DIRECT challenge to the men engaged in construction comes from two hardheaded, conservative representatives of the art, Frederick L. Cranford and General R. C. Marshall, Jr., contractors both. They put forward questions that appear to be different but on analysis are the same: How can construction be stabilized? The question addresses itself not to the government, not to the citizen at large, not to chambers of commerce and rotary clubs, but to the construction industry; and unfortunately there is no such industry.

Working with different facts and premises, the two contractors agree that construction is not stable. Mr. Cranford seeks stability in that elusive and yet vastly important activity, housebuilding. General Marshall is concerned over an equally difficult stabilization, one which would balance public works against industrial activity, using one to take up the fluctuations in the other. If either objective could be gained the situation of construction would be bettered. To attain either one would mean far-reaching changes in the construction mechanism, from finance to labor control. Little or nothing can be accomplished until the industry can think and act together.

Every industry is subject to fluctuation of activity, even violent fluctuation, as we have recently learned. Some people are therefore inclined to believe that nothing can be done for construction except by measures that will stabilize all business—by doing away with the tendency of the mass mind to have spells of hopefulness and gloom, to shift from speculation to caution. They overlook the fact that construction is the response to the world's continuing physical needs, growing in a regular way and little dependent on mood or emotion. They also overlook the basic position of construction, and the fact that construction like agriculture is the foundation of all other activity. Hopes of stabilizing construction need not, therefore, wait on the much larger problem of stabilizing business as a whole.

What is at issue is not merely the solution of a problem confronting contractor, laborer, engineer and architect, but also solution of the problems of the extensive supply industries that serve construction. At present these must work under the handicap of wide fluctuation in production to fit unforeseen fluctuation of demand. Plants, processes, trained working organizations—all are harmfully affected, and this reaction intensifies the oscillations of activity in the consumption industries and in general business prosperity.

The problem placed before the profession by Mr. Cranford and General Marshall is the greatest that it has yet faced. It is the summation of all the economic and business questions that have occupied engineers and builders for many years past. It claims the thought of all, not alone as individuals but as members of an independent group, who stand or fall together.

We need look for no help from government. Presidents, congresses and city councils will not answer the question. Governmental agencies are powerless and arbitrary. Between the tax collector on the one side and public pressure on the other, they cannot deal with industry problems. The country's second industry in importance should never become a government dependency. Its salvation lies in its own cooperative action. To make such action possible, it is needful that the industry become coherent and organized. As yet it is not an industry.

Amendment or Repeal?

EXPERIENCE in the application of the Bacon-Davis prevailing-wage law is disclosing the expected difficulties. Neither the contractors in their bidding nor the federal officials in awarding contracts are finding satisfactory means of determining prevailing rates of wages. Attempts at rational determination of rates have not been successful, and in consequence arbitrary decisions have been made. It is hoped that these decisions will not be reversed later on by the Department of Labor, which under the law is final arbiter of what constitutes "prevailing rates of wages.

Sound building practices being impossible under these conditions, amendment of the law is being urged by the Associated General Contractors. Action for amendment calls for exceedingly careful consideration if its reaction is not to be injurious rather than beneficial to contracting. The law is most to be feared not because of its direct effect on public-building work but because it will be an incentive and model for wider legislation. It applies only to federal building construction, but state laws modeled on it are now being written to include all public works. It may itself, if opened up for amendment, be broadened to include all federal construction.

The only sound action that construction can take is opposition to and repeal of prevailing-wage legislation. Long before the legislators whose names are given to the present federal act were moved to draft it by charges of wage cutting, there was a prevailing-wage law in New York state; it had become as inactive as the laws of the whipping post and the ducking stool. Prevailing-wage legislation has proved to be unworkable.

Under the Bacon-Davis act, contractors are required to pay the prevailing wage of the trade in the locality of the work. The contracting officer of the work is required to review the contractor's figures. Whenever dispute arises, some desk worker in the Department of Labor becomes the final judge with power to specify the wages to be paid. Thus, three separate parties must determine prevailing wage scales: the contractor, the contracting officer and the Department of Labor. The last two have no jurisdiction until the contractor has made his bid and been awarded the contract, but thereafter either one can change the wage scale on which the bid was based. Federal contracting officials working under the law deserve credit for recognizing the potentialities of the situation for dispute and delay, its essential unfairness to bidders and perhaps the hazard of unfavorable review by the courts. They have advised contracting officers to fix prevailing wage rates in their call for bids.

To correct the situation the Associated General Contractors propose these amendments: First, the contracting official in calling for bids shall specify the prevailing wage rates; second, if wages rise or fall during the progress of the work the contractor or the government shall receive proportionate compensation. The first amendment merely makes mandatory the practice already advised, but does not simplify the main problem of determining what prevailing wages are. The second amendment is certain to set up some form of accounting supervision by the contracting agency. The best that can be said of this amendment is that it begets a hybrid offspring of cost-plus and straight contracting that is without the virtues of either.

What of repeal, then? Can it be brought about? Yes, if contracting is willing to make the necessary sacrifices and fight for it. To fight boldly and successfully the industry will have to demonstrate its capacity to battle militantly those in its ranks who are cutting wages and exploiting unemployment. The industry will have to show that it can unite in concerted action to guard its interests.

The construction groups have never worked together; until they do construction will have only a feeble voice in the halls of legislation. Is the present not the time for change? Or shall prevailing-wage laws, automatic credit legislation and a dozen other usurpations of business rights and duties by lawmakers make further headway? These questions deserve not only serious thought but a definite reply in positive action by construction.

Bridging the Golden Gate

BEFORE the 3,500-ft. Hudson River span is opened to traffic an even greater structure will be under construction at San Francisco. With its 4,200 ft. between towers the new Golden Gate bridge extends materially the bridge builder's accomplishments. For the citizens of the West Coast a dream has come true and another of their major water barriers has yielded to the demands of motor transportation and to the genius of modern engineering and industry.

Any consideration of this great new project invites comparison with the bridge at New York. Such comparison is indeed inevitable, for the Golden Gate bridge design is a fact today because the Fort Lee bridge was built yesterday. It was the latter project that attuned the public mind to the possibility of financing such huge enterprises. It was the Fort Lee bridge that gave wire manufacturers the opportunity to demonstrate the practicability of 36-in. diameter cables; to improve the technique of cold drawing of wire so as to produce a product with an ultimate strength of 250,000 and a yield point of 190,000 lb. per sq.in.; to develop a pre-stressing method that provides the designer with suspender and footbridge ropes of accurate length; and to prove that an unbelievable speed of cable spinning can be maintained day in and day out. These precedents served the designers of the Golden Gate bridge in proportioning their structure and in laying out their construction schedule.

Part of the designers' task had thus been smoothed out. But the possibility of earthquakes at the Golden Gate interposed new problems. That these have been met, by sinking the piers deep into the rock, by anchoring the towers to the piers and by proportioning the towers to resist lateral forces of considerable magnitude, makes precedent. An original method for pier construction in the open sea has been devised that holds much promise of valuable experience and of success. A great and imposing bridge was required for the prominent setting provided by the Golden Gate. The design of the new span at least satisfies this demand.

In so far as the future of bridgebuilding is concerned these facts are vitally important. Every new project must perforce lean heavily on its predecessors, as did, for example, such trail-blazing structures as the Brooklyn, the Delaware and the Hudson River bridges. But if it is to deserve a place in the first rank it must in its own right contribute some new suggestion or design that may be used as a stepping stone when the next great project is pushed ahead into the realm of the untried. Measured in these terms, the Golden Gate bridge will compare favorably with other great bridges.

Drainage Works for the New Madrid Floodway

Construction of back levee across natural drainage courses necessitated a ditch system, culverts and bridges costing half a million dollars

By T. T. KNAPPEN
Engineer, First Field Area, Memphis Engineer District, Cairo, Ill.

THE DRAINAGE WORKS of the New Madrid floodway are of importance chiefly because they emphasize one of the supplementary problems of Mississippi floodway construction that has been overshadowed by the larger interests affected by these diversions. In the New Madrid floodway the necessary drainage works make up nearly 15 per cent of the construction cost. At the opposite end of the flood-control works, flood-proof highway and railway crossings of the Bonnet Carré floodway will cost millions. Both drainage and crossing problems exist in the greater floodways of the Boeuf and Atchafalaya basins.

In the description that follows of the New Madrid floodway drainage works the undertaking has been to give enough detail to indicate varieties of structures, modern construction methods and cost averages.

—EDITOR.

THE drainage works of the New Madrid floodway are broadly of three classes: (1) the special works of the Brewers Lake Basin, including drainage of the town of Wyatt, a controlled culvert through the levee, and a spillway over the divide; (2) the drainage ditch system; and (3) the bridges and road crossings.

Brewers Lake Basin Drainage

Near Birds Point there is a drainage area of about 35 square miles in the Brewers Lake Basin, which now has its outlet in a culvert through the river levee. In flood time this outlet is closed, flooding the lower lands in this basin with drainage and seep water. To permit the water from the 15 square miles of this basin, which lies back of the new floodway levee, to reach its present outlet, a culvert is being constructed through the new levee where it crosses the main ditch of the basin near Brewers Lake. To prevent the water in back of the floodway levee from reaching a greater height than under present conditions, a high level spillway in a cut through the drainage divide is provided to permit excess drainage water to flow southward into the main intercepting drainage system. Automatic control to prevent backflow is being provided.

The town of Wyatt in the basin, as shown by Fig. 1, was drained by two lines of tile that were to be crossed and cut off by the levee. The new plan provided an 18- and a 24-in. sealed-joint pipe line to intercept these tile lines and carry their discharge west about a mile to the new ditch. The contract for this work was let to the Riley Contracting Co., of St. Louis; it consisted of 3,600 ft. of 24-in. plain concrete pipe and 2,000 ft. of 18-in. plain concrete pipe, and nine brick and concrete manholes and catch basins. The total cost to the United States, excluding engineering and overhead, was approximately $15,000. Roughly, the cost, including manholes, of the 24-in. line was $3 per foot, and of the 18-in. line $2 per foot.

The culverts for the main drainage of the basin included the large culvert through the new levee, a controlled spillway culvert at the divide between Brewers Lake Basin, and the main drainage system, and a concrete culvert under the state highway, just south of this controlled culvert or spillway. All three of these structures are of reinforced-concrete box type. The last two had roadways over them, and the first carried the levee. The contractor was the J. J. McCaughey Co. and the States Contracting Co., of Chicago.

The main culvert through the levee indicates the type of structures. This culvert was of the rigid-frame double-box type, with two 4x5-ft. openings. The foundation material was a firm clay, so no supporting piling was deemed necessary; the culvert was also located in a bypass from the main drain to avoid unstable foundations. On the river side a steel sheetpile and concrete cutoff apron was provided. Also to prevent seepage along the barrel, concrete cutoff rings were provided at 35-ft. intervals, extending out 2 ft. from the barrel. The barrel is 175 ft. long and terminates in concrete headwalls at each toe of the levee. It was designed as a longitudinal beam to span 50 ft. carrying the full superimposed levee load. The bypass ditch was paved for 50 ft. on both sides of the levee with 6 in. of lightly reinforced concrete. Fig. 2 shows the culvert barrel after stripping and the forms for the end wall.

Normally, the drainage will flow through this culvert from the land side to the river side. To prevent a reversal of flow, two 60x48-in. cast-iron vertical-lift gates operated from a concrete platform at maximum flow line were installed on the river side. For additional safety, stop-log grooves were provided on the land side, so that an emergency closure can be made.

On this contract the United States furnished cement, gates, and culvert pipe, and the contractor furnished all other materials. The total contract price was about $20,000. Favorable weather and working conditions enabled the contractor to handle the work well within his contract price. The actual cost to the government per cubic yard of concrete, including cement and reinforcing steel, was about $24. Under less favorable conditions requiring a large amount of pumping, the total cost might have been increased as much as 20 per cent.

Main Drainage-Ditch Construction

As the general drainage of the country is toward the levee (Fig. 1), it was advisable to place the intercepting ditch as near the levee as safety would permit. Above backwater the ditch has been constructed on a separate right-of-way, generally about 1,000 ft. from the levee. In this upper 19 miles no effort has been made to use the material excavated from the ditch for the construction of the levee, the levee material being taken from standard river-side borrowpits.

In the next 12 miles, to the junction of the drainage with Dr. John's bayou, a land-side borrowpit is utilized to construct the levee and to carry the drainage. This is not considered dangerous, as there will be backwater to provide sufficient balancing head to prevent destructive underflow. At the end of this section between contracts 4-E and 4-F (Fig. 1) the present drainage from the floodway area crosses the levee line. From this point to the end the drainage from the back side of the levee is carried in its natural channel on the land side of the river, and on the river side an artificial channel is provided to carry the drainage from within the floodway to the river. The levee is constructed in this stretch from the material excavated from this river-side drainage canal, but a wide berm is provided to allow for future erosion.

The contract for the construction of the main ditch and appurtenant structures was let to Clarke Brothers Construction Co., of Clinton, Ia., who already had contract No. 4-B. This contract involved primarily the excavation of 1,500,000 cu.yd. in the construction of 25 miles of ditch. The bulk of the work is concentrated in the last 7 miles, throughout which the ditch has at least 1 on 3 side slopes, a bottom width of over 25 ft. and a depth varying from 8 to 18 ft. The materials vary from a heavy clay to a quicksand formation encountered in crossing one ridge. In all cases a 25-ft. berm between the edge of the cut and the toe of the spoil bank is required. The height of spoil is limited to 15 ft.; and on all cuts exceeding 2,000 cu.yd. to the bottom, spoil is placed on both sides of the ditch.

In many places there is a tendency for surface water to drain from the ditch toward the levee; in these cases it has been necessary to provide small new ditches to carry the water back to the ditch or to reverse the direction of flow in existing farm or road ditches. Wherever side drains come into new ditch, concrete and brick catchbasins (Fig. 9) are built at the outside toe of the spoil bank, and galvanized iron pipe of the required size is laid under the base of the spoil bank and across the berm in a trench that is later refilled. The pipe (Fig. 4) extends out from the bank of the ditch so that the discharge will fall on a water cushion. The catchbasin is constructed and the pipe laid under the spoil bank before the ditch is excavated. Numerous farm-drain tile lines are crossed by the ditch. If water were allowed to flow through the tile into the ditch as left after excavation, there would be a tendency to create washes in the bank, as the short sections were undercut and fell in. To avoid this, the tile is taken up for a distance of 10 ft. from the edge of the cut and replaced with a 20-ft.

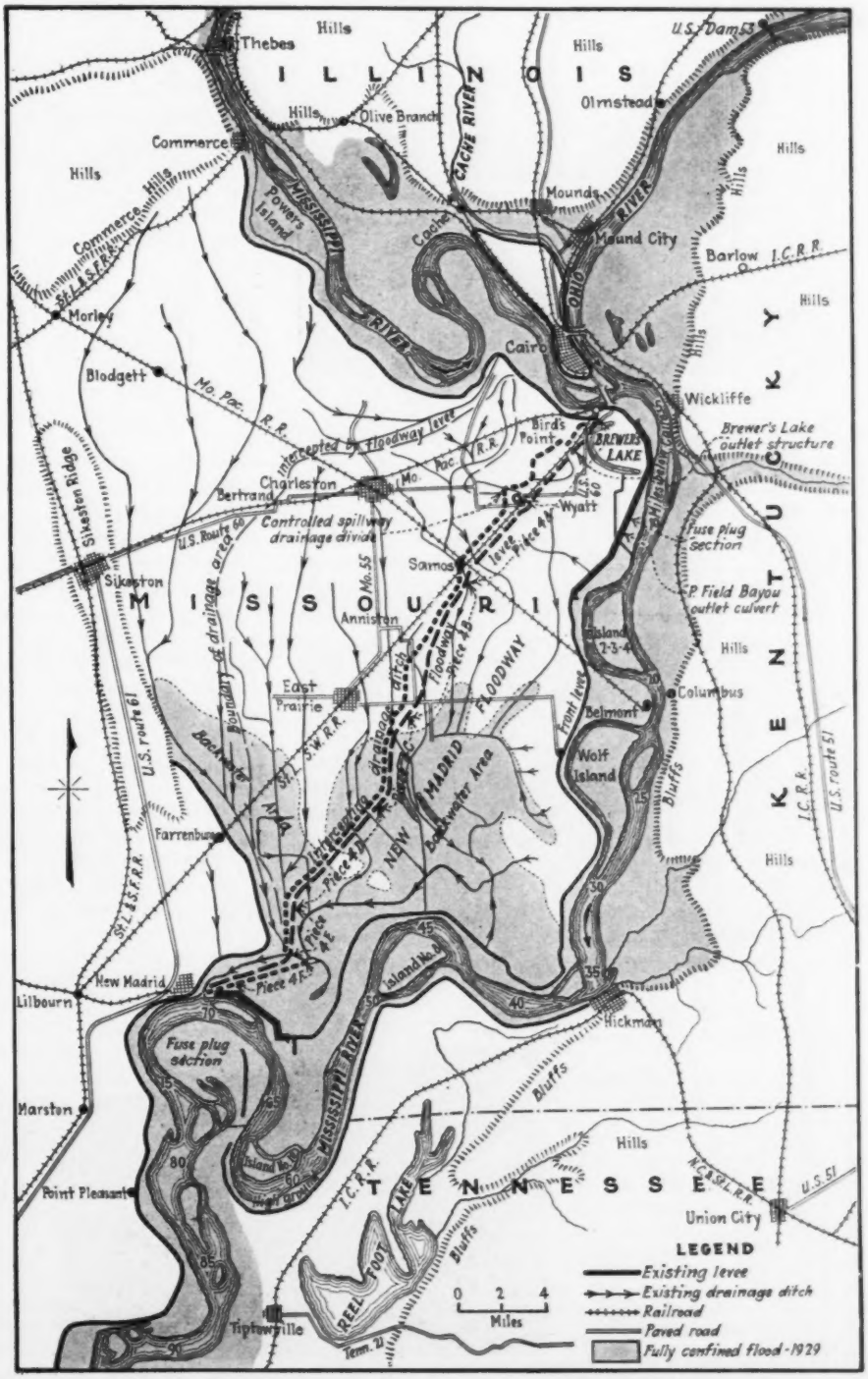

Fig. 1—Map of levee and drainage system of New Madrid floodway

Fig. 2—Concrete-box culvert under floodway levee

Fig. 3—Side-ditch outlet under main-ditch spoil bank

length of galvanized iron pipe of the same size, which then extends 10 ft. out into the ditch.

On the ditch excavation the contractor has two 3-cu.yd. 70-ft. boom crawler draglines and one 1-cu.yd. dragline. In excavating the larger sections the machine generally tracks over a length of ditch about three times. The spoil areas are so laid out that about 40 per cent of the material is wasted on one side and 60 per cent on the other. The machine first cuts the 40 per cent from the east side of the ditch and then tracks back, taking the center 30 per cent and placing it in the ditch side of the west spoil bank, establishing the berm line. In the final operation the machine tracks ahead again, cutting out the remaining 30 per cent on the west side and throwing it beyond the spoil bank already placed. The contract prices were 10c. a yard for 100,000 cu.yd. of small ditch and cleanout work and 6.85c. for 1,400,000 cu.yd. of new ditch.

The levee and the parallel ditch cut diagonally across a developed farming country for 75 per cent of their length. State highways, county roads, and private roads are crossed, and large property ownerships are severed. Crossings had to be provided.

Levee Crossings — Over the levees earth ramps were built of various widths and grades, surfaced where necessary with gravel. The earthwork in these ramps is a regular part of the levee contract. For hard-surfaced roads the crown width is 30 ft., 5 per cent grades are used and vertical curves are built; on main dirt roads the same 5 per cent grade is maintained, but a crown width of only 24 ft. is required; on less traveled dirt roads 20-ft. crowns and 7 per cent grades are the rule; and for private crossings, side ramps on 10 per cent grades with 14-ft. crowns are standard.

Across the borrowpits where these were not used for the main drainage channel, traverses of the same crown width as the crossing were left. Drains through these traverses, to prevent water from pooling in the borrowpits, varied in type depending on the size required and the type of road. Up to 36 in., galvanized corrugated iron pipe was used; where greater area was required on main roads, concrete box culverts were specified; and on minor crossings where a large area was needed, creosoted timber short-span bridges were used.

Bridge Location—The main ditch, which handles up to 2,500 sec.-ft. at the lower end, crosses three state highways, two railroads and fourteen county roads. Many ownerships were badly severed; some of these required bridges and some did not. One of the highway crossings could be taken care of by a concrete box culvert. In going under one railroad the existing trestle would serve. Under the other railroad the cheapest solution was found to be a double 9x12-ft. box culvert. This left two highway bridges and fourteen county bridges that must be constructed. As a result of negotiations with the state and county, it was decided that these would be of permanent type.

The location of private crossings was largely a question of economics. Experience in acquiring rights-of-way indicated that if a relatively small parcel of land was cut off from an ownership by the right-of-way and no crossing was provided, the government would have to pay a large percentage of the value. Of course as the severed portion increased in size the percentage of damage was reduced, since it could be handled more practicably as a separate unit. Then the rule of location for private crossings was this: if the installation of a bridge would reduce the amount of the estimated severance damage by an amount greater than the cost of the bridge, the bridge should be included; if not, it became cheaper to pay the severance and not put in the bridge. In the upper part the land was more valuable and the ditch smaller, so that private bridges were frequently justified; toward the lower end, where the ditch is larger, the expense of private crossings became larger and land values less, with the result that in the last 20 miles there are no private bridges.

Structures Standardized—In general, certain features of design apply to all types of bridges. Pile supports

Fig. 4—Metal-pipe outlet of tile drain to ditch

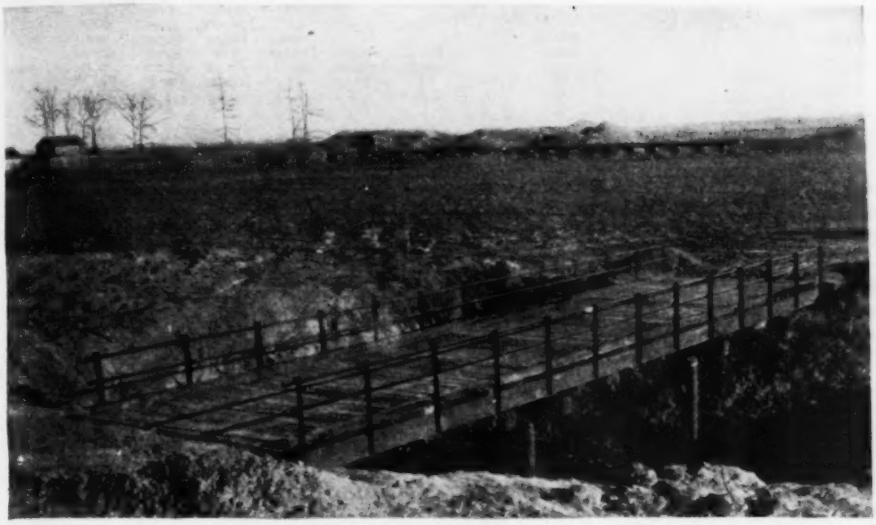

Fig. 5—Timber highway bridge across ditch

are used throughout, even the end sills in most cases being carried on piles. Large abutment walls were avoided except where necessary to retain a fill, and then in most cases they were merely slabs spanning between the piles of the end bent. Standard 2-in. pipe hand-rail was used on all bridges. No skew bridges were built except on state highways. All bridges were one-way with a 13-ft. clear roadway, except the two state highway bridges and two county bridges on roads undergoing improvement. These four bridges have 20-ft. clear roadways. Except where the bottom width of the ditch was greater than 50 ft., no bents were placed on the bottom, and in that case a minimum span of 50 ft. was used.

The design finally adopted for private crossings was a creosoted timber structure for both piles and superstructure, except that on spans of more than 21 ft., steel I-beams were used. All general details were standard, and all spans of the same length were of the same design. Three pile bents were used. The flooring was 4 in. thick, with 6x6-in. guard-rails. These bridges were designed for 10-ton truck loadings. Fig. 5 shows a completed timber bridge.

For the state and county road bridges the construction was again standardized on concrete pile bents, steel I-beams and concrete floors. On the one-way bridges three pile bents, and on the two-way bridges five pile bents were used. Consideration was given to using wood flooring, but a study of costs showed that concrete was cheaper on first cost alone, when the fact that concrete plant would be on each job was considered, as well as when account was taken of the T-beam action of the slab. In any case, flooring represented only a small part of the cost of the structure.

Construction Plan and Methods—In planning this work it became apparent that there was an excellent opportunity to secure economy if the bridges could be built before the ditch was excavated. This would permit traffic to be detoured through the fields adjacent to the site of the work and so eliminate the expense of temporary bridges or the inconvenience of long detours. Another important consideration was coordination of the work; if bridge construction were to follow excavation, the efficiency of the bridge-constructing operation would be greatly reduced; and as the amount involved in this contract was large, such a result was to be avoided.

It was also apparent that this would eliminate the necessity for falsework in the ditch to carry the pile-driver. However, it was anticipated that if the piles were driven from the surface of the ground, it would not be possible to secure sufficient penetration on one hand, or on the other, to determine when adequate bearing had been reached. to take care of this, a narrow trench was required to the depth of the ditch excavation through which the piles were to be driven. To avoid complications between contractors, the bridge contractor was required to excavate the ditch for 10 ft. on either side of the bridge.

The contractor on these bridges and culverts is the Forcum-James Co., of Dyersburg, Tenn. Their equipment includes one two-bag and two one-bag mixers; two convertible crawler machines used as draglines, cranes or clamshells, as required; four 1½-ton trucks and three 1-ton trucks; one skid-rig piledriver with 55-ft. leads; two drum hoists; a steam hammer and miscellaneous equipment, such as pumps, etc.

In constructing the timber bridges the first step was to excavate the ditch section included in the contract. This was done with one of the crawler machines, then the same machine picked up a set of leads and drove the timber piles. The piles were then cut off, the ends

Fig. 6—Fabricating reinforcement for concrete piles

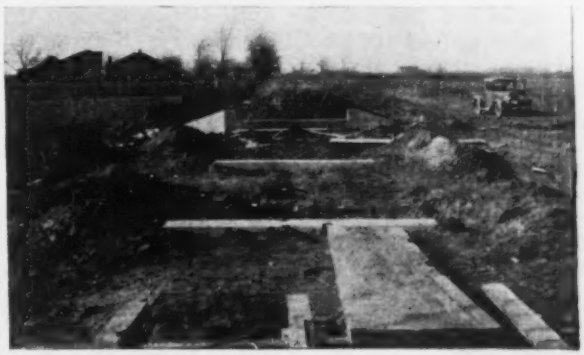

Fig. 7—Concrete bridge substructure before excavation of ditch

tarred and covered with galvanized iron, and the caps placed. The machine then was used as a crane to place the stringers or I-beams; when this was done it moved on, and the rest of the work was done with hand labor. It was found that the ditch section could be excavated before driving piles, as the boom machine could stand on the bank and reach the bents with hanging leads.

For the concrete bridges the first step was to cast the piles on the site. Fig. 6 shows the reinforcing for the piles being built up. They were allowed to cure from 15 to 30 days, depending on the weather. While the

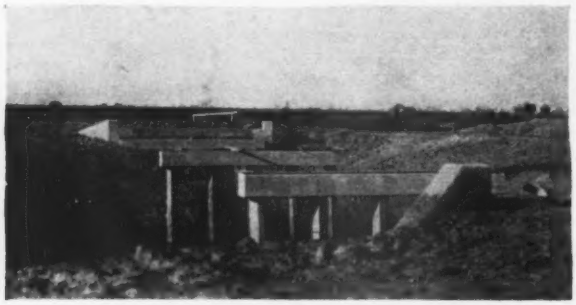

Fig. 8—Ditch excavated and substructure ready for decking

Fig. 9—Completed concrete road bridge

piles were curing a detour was constructed. When the piles were sufficiently cured the driving trench was excavated and the skid rig moved into place. The piles were then driven to the required penetration on bearing, and if necessary, built up where the estimated penetration was exceeded; a mixer was then moved in and the caps and abutments poured. Fig. 7 illustrates this stage of construction. When the caps had set, a dragline moved in and excavated the ditch section between the pile bents and set the steel I-beams. Fig. 8 shows the stage just previous to placing the I-beams. Forms were built, and another mixer moved in to pour the floor and guard-rail. The last operation was to set the hand-rails and paint all steelwork. Fig. 9 shows a completed short-span bridge. The piling carrying the span is independent of the abutments.

This contractor's problem was largely one of coordination of widely scattered operations. The rapid progress that he has made is due to his efficient operation and the prevailing good weather.

Costs—The accompanying table is a summary of costs per linear foot of bridges of the different types used, not including excavation costs, together with pertinent data on these types.

Type	Loading	Width Roadway, Ft.	No.	Total Length, Ft.	Aver. Length, Ft.	Aver. Length Span, Ft.	Aver. Lin.-Ft. Piling Per Ft. of Bridge	Aver. Cost Superstructure Per Ft.	Aver. Cost Substructure Per Ft.	Aver. Cost Bridge Per Ft.
Creosoted Timber	H-10	13	9	619	48	23.1	3.96	$17.01	$6.30]	23.31
Concrete County	H-15	13	14	1,347	96	40.5	2.76	33.52	20.92	54.44
Concrete County	H-15	20	2	240	220	39.3	3.87	45.08	23.34	68.42
Concrete State	H-20	20	2	220	210	36.7	4.83	53.83	33.71	87.54

This work has been designed and carried out under the direction of Lieut. Col. F. B. Wilby, district engineer, Memphis Engineer District, and reviewed and approved by Brig. Gen. T. H. Jackson, president of the Mississippi River commission, and by the chief of engineers, U. S. Army. The construction plans were prepared and construction was supervised by the writer, area engineer, First Field Area, Memphis Engineer District, under the direction of the district engineer. The area engineer's assistants in the design and construction of this work are G. L. Perry, associate engineer, principal assistant; G. A. Amberg, assistant engineer, drainage, bridges, and general design; W. A. Steele, assistant engineer, levees; J. N. Van Frank, assistant engineer, rights-of-way, surveys and drafting; E. F. Tippetts, inspector, in charge of levee inspection; and Leonard G. Hogue, inspector, in charge of drainage inspection.

Colorado Completes Last Link in Colorado River Highway

THE Colorado state highway department has just completed a 15-mile stretch of new road along the Colorado River on state route No. 4, between De Beque and the mouth of Plateau Creek. This piece of road eliminates a 23-mile detour through the Plateau Creek

Building new road along Colorado River, De Beque, Colo.

Canyon, which was always dangerous in wet weather and subject to frequent slides. It also completes the last link in the highway following the riverbank between Dotsero, at the junction of the Eagle and Colorado rivers, and Grand Junction. Excavation, mostly solid rock, averaged 42,000 cu.yd. per mile, and the road is finished with 1,000 cu.yd. of gravel per mile. Hinman Brothers, Denver, had the contract for the work, which was done under the supervision of J. J. Vandermoer, division engineer of the Colorado state highway department.

Possibilities and Limits of the Water-Sewage-Water Cycle

Natural cyclic use in the Ruhr district leads to special experiments showing that eleven cycles of satisfactory purification are possible, with salinity as the final limit

By Dr. KARL IMHOFF
Essen, Germany

Translation by CHARLES GILMAN HYDE
Professor of Sanitary Engineering, University of California, Berkeley, Calif.

AT A large experimental sewage-treatment plant in Los Angeles R. F. Goudey has demonstrated that good drinking water can be produced from city sewage at small cost. Purification, as noted in *Engineering News-Record*, March 21, 1931, p. 443, is accomplished by sedimentation, activated-sludge treatment, chemical precipitation, chlorination, sand filtration and filtration through activated carbon. The purified water is to be distinguished in no respect from the best of potable waters. With this water it has been proposed to meet in part the water requirements of the city as it would be wasteful to discharge this valuable water into the sea.

While this proposal may appear strange, strictly it is not in conflict with existing facts of water practice. In America by far the greater part of the public water supply is derived from river water, and in Europe also, where spring water or groundwater is no longer sufficient in quantity to supply the cities, river water will more and more be drawn upon as a supplementary source. But river water often is nothing less than diluted sewage: One city discharges its sewage into a stream and another community below utilizes the water thereof for its public supply. One may thus speak of the circuit, water to sewage and back to water, in many instances repeated again and again without causing prejudice to arise. The Ohio in North America, and the Rhine, the Elbe and the Ruhr in Germany, are examples.

Under normal streamflow conditions, sewage constitutes but a small, in fact a vanishing, portion of the entire volume of water. During severe drought the streams become heavily burdened and then their water in large measure is composed of modified sewage.

Ruhr Valley Conditions

In one such case, occurring during the extrordinarily dry summer of 1929, we in the Ruhr district have been able to follow the process and calculate the results with fair accuracy. The waterworks of this distict obtain their supply from filter galleries, partly fed from the river and the underground flow, and partly from filter basins to which water is dumped from the Rhine (Fig. 1). These waterworks furnish a supply for drinking and domestic purposes to an aggregate population of 3,500,000 persons in the Ruhr and several neighboring river districts. During the dry summer of 1929 the yield of the Ruhr became so greatly reduced that no upland water reached its mouth during a period of several weeks. In Fig. 3 are presented the flow conditions

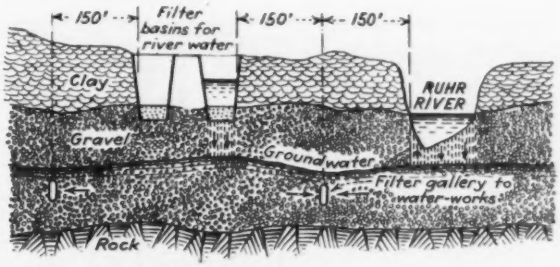

Fig. 1—Yield of filter galleries near Ruhr River reinforced by pumping from Rhine to filter basins, above galleries

on Sept. 12, 1929, in the stretch of 56 miles extending from Hagen to the mouth of the Ruhr in the Rhine. The upper broken line shows the draft on the part of the waterworks; the lower broken line the returned water —that is, the sewage quantities contributed by the cities and by industry.

At Hagen the streamflow on Sept. 12, 1929, was 282 sec.ft. In the stretch from Hagen to the Rhine the waterworks withdrew 458 sec.-ft. This was made possible by the fact that 141 sec.-ft. of return flow entered the Ruhr as sewage and 35 sec.-ft. of compensation water was pumped back from the Rhine. The waterworks pumped into outside districts, or else there was otherwise lost, some 317 sec.-ft. of water. It will be seen from the diagram that in a distance of 56 miles the water passed three times through the cycle from public water supply to sewage.

The purification processes to which the water was subjected in these cycles in the Ruhr Valley are as follows: (1) partly mechanical, partly biological sewage purification in the treatment plants of the Ruhrverband; (2) biological self-purification in the Ruhr River, with an average flow period of twelve days for each cycle; (3) soil filtration in the natural soil filters of the waterworks. During the dry summer of 1929 these purification processes were thoroughly satisfactory. The resulting water was always of the best quality. Furthermore the taste was good and the number of cases of typhoid was never lower than during this period.

Limits of Cyclic Use

When one has at length accustomed himself to the thought that sewage in the cycle herein considered is repeatedly utilized, the question arises: "How many times may this rotation be permitted to occur?" Some limit must be set. Certain substances, for instance common salt, are not removed by any artificial or natural purification process; they remain however often the purification cycle is repeated.

In its laboratory at Essen, the Ruhrverband through

Dr. Sierp has conducted interesting experiments along this line. The experimental plant consists of the following: A sewage tank holding 13.2 gal.; an activated-sludge plant of 10.6 gal. holding capacity (an aerating tank with activated-sludge and secondary clarification basin); a slightly aerated fishpond holding .92.4 gal.; a coarse sand filter, and a vessel for purified water holding 13.2 gal. In this plant 13.2 gal. of sewage was treated every day for 99 days during the period from November, 1930, to March, 1931. The sewage was produced daily from 13.2 gal. of returned purified water, 0.13 gal. of urine and 0.26 gal. of fresh sludge from the city of Essen. The calculated flowing-through time for

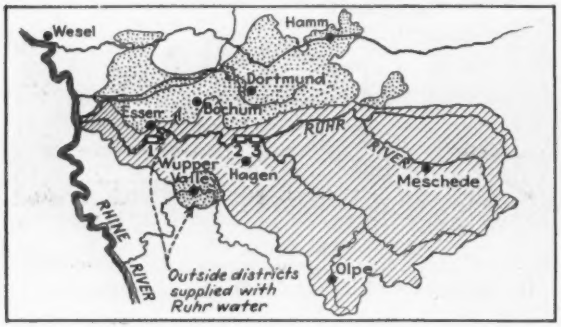

Fig. 2—The Ruhr district and other watersheds furnished with Ruhr water

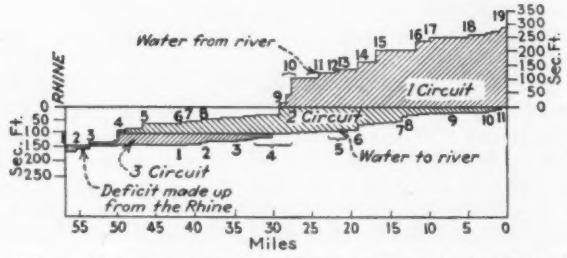

Fig. 3—Circuit of water to sewage to water in the Ruhr from Hagen to the Rhine at a low stage on Sept. 12, 1929

Above, top line—(1) Junction with Rhine; (2) Rhein. Stahlwerke; (3) Gutehoffnungshütte; (4) Rhenish Westphalian W.-W. 11; (5) Rhenish Westphalian W.-W. 1; (6) Velbert (city); (7) Kettwig (city); (8) Krupp works; (9) Essen (city); (10) N. Westphalian coal district; (11) Bochum water district; (12) Gemeinschaftwerk; (13) Hattingen (city); (14) Henrichshütte; (15) Bochum (city); (16) N. Westphalian coal district; (17) Witten (city); (18) Wupper Valley; (19) Hagen (city).
Below, bottom line—(1) Kettwig (city); (2) Velbert (city); (3) Dellbach; (4) Essen (city); (5) Hattingen (city); (6); Sprockhoevel Creek; (7) Oelbach (creek); (8) Witten (city); (9) Pless Creek; (10) Hagen (city); (11) Volme River.

this plant is nine days. In the 99 days in question the water passed through eleven cycles of purification in the plant. It was thus eleven times polluted and eleven times repurified. Compensation was made for the loss through sampling and evaporation, which during the period of the experiment amounted to half the water volume.

After the fifth cycle the plant experienced its first crisis; four of the eighteen fish in the fishpond succumbed. The cause was the acidulation of the water by free nitric acid, a product of biological purification. The pH value had fallen to 4.5 The difficulty was removed by the application of soda and lime to yield a pH value of 7.2. Lime was again required after the eleventh cycle.

The changes in composition of the water during the period of the experiment are shown in the accompanying table.

Constituents	Original Water	Water After First Cycle	Water After Eleventh Cycle
pH value	7.5	7.5	7.0
	Parts per million		
Chlorine	48	102.0	380.0
$KMnO_4$ consumption	19	30.0	44.0
Organic nitrogen	..	2.7	2.8
Nitrates	10	44.0	122.0
Nitrites	..	0.4	0.4
Free ammonia	..	2.4	2.4

The bacterial counts were as follows: influent, 1,700,000 to 2,800,000 per cubic centimeter; activated-sludge treatment effluent, 17,200 to 765,000 per cubic centimeter; fishpond, 25,000 to 114,000 per cubic centimeter, and effluent of the coarse sand filter, 11,600 to 52,000 per cubic centimeter.

It will be seen from the table that, except for the chlorine (common salt, NaCl), after the eleventh cycle no single figure for any constituent had reached a threatening value for river water. As already stated, the pH value can be controlled only by the application of lime. When natural waters are concerned in the cycle the conditions are presumably more favorable, since the natural streambed commonly has a considerable acid neutralizing or holding ability in contrast with the clean sand in the little fishpond. The occasional application of lime in large working plants offers no difficulty.

At the completion of the eleventh cycle the chlorine figure had mounted to 380 p.p.m.; thus to the limit of taste. Since the salt content is not removable by any available means of water purification, it is to be seen that the practical limit of recovery of potable water from sewage is that of excessive salinity.

Viewed from the standpoint of water purification and as a result of observations from nature and from experiment, there can be little doubt that city sewage can be purified and re-used in rotation as many as ten times. This implies that in order to halt the increasing salinity a city is required to furnish its regular water supply only in the amount of 10 per cent of the collected sewage volume. Merely this 10 per cent, plus the evaporation loss, is required as pure water brought from without. The city's remaining water requirements can be met from its own sewage. For arid districts these demonstrated facts have great significance.

Theory and Practice With Building Lines

Experience in Connecticut with building lines established under eminent domain—not setbacks laid down in zoning ordinances—indicates that there is a distinct field of usefulness for them. So stated Herbert S. Swan, consultant in city planning, at the meeting of the City Planning Institute, March 14. Building lines appear to be the only hope for securing wider streets in many communities. Some of the pertinent points brought out in Mr. Swan's conclusion as to the situation in Connecticut, where numerous cities have had long and varied experience with boundary lines, are as follows:

Building lines should conform to street width laid down in a major street plan. No existing building lines should be vacated until such a plan has been worked out. Building lines as an intermediate means of ultimately obtaining wider streets should be limited in their application to streets already laid out. They should not be used to protect front yards, this being the province of zoning. Building lines and zoning regulations should complement one another. Cities with building lines will be enabled easily to remake their horse-and-buggy thoroughfare plan to meet the demands of the motor age, whereas those with no building lines are finding themselves two generations behind the times.

Continuous Algae Control by Use of Chlorination

By F. J. SETTE
Associate Professor of Sanitary Engineering, Virginia Polytechnic Institute, Blacksburg, Va.

CHLORINATION of an impounding reservoir at Pulaski, Va., has proved an effective method of algæ control. During a recent dry period leakage through the rockfill dam was chlorinated before being pumped back into the reservoir, and the resulting diffusion of chlorine destroyed the organisms producing tastes and odors.

Pulaski obtains its water from a reservoir about 3 miles to the southwest. The watershed lies in the foothills of Draper Mountain and has an area of 2.73 square miles. The reservoir impounds 200 million gallons and is Y-shaped with the intake at the end of the Y stem. At this point it is about 215 ft. wide and 50 ft. deep. The impounding dam is of the rockfill type.

Early in the spring studies were begun on this reservoir to determine the causes for odors and tastes, which usually begin to be objectionable in midsummer. During the latter part of May and throughout the month of June glenodinium was usually found in the bottom layers of water in varying, but usually small, amounts. During the first part of July these organisms moved out of the bottom layers, which by this time had no more dissolved oxygen, as can be seen from Table I. Because of the fact that the organisms were increasing so rapidly, copper-sulphating of the reservoir before the end of the month was advised. However, at this time, because of a water shortage, it was deemed advisable to pump back into the reservoir the leakage through the dam, which amounted to about 350,000 gal. per day. Since the leakage showed contamination, the water was chlorinated before entering the pumps, using 15 lb. of chloride of lime per day. Although the pumping began on July 11, no effect on the algæ had been noticed by July 14. However, by July 21 there was a marked reduction in algæ and protozoa, and there was no glenodinium in any of the layers. On July 28 there were but two at the 20-ft. depth. On Aug. 4 again there were none.

Chlorine-distribution studies were made on July 30 to see how the chlorine that was being put into this pumped leakage was distributed throughout the reservoir. It should be noted that the leakage was returned to the reservoir 50 ft. from the dam. About 60 samples of water were obtained 400 ft. behind the dam at various depths. Table II shows the residual chlorine found at various depths.

At the time of the study the zone of circulation extended to the 10-ft. depth and the transition zone probably to the 21-ft. depth. During this time 71 m.g. of water was treated with about 300 lb. of chloride of lime. Samples were also taken at the fork in the Y about 900 ft. back of the dam, and it was found that the surface contained 0.07 p.p.m. of residual chlorine, and the bottom 11 ft. contained 0.11 p.p.m.

TABLE I—PLANKTON CONTENT IN PULASKI RESERVOIR

Depth, Ft.	July 7		July 14		July 21		July 28		Aug. 4		Aug. 11	
	A	*B*	*A*	*B*	*A*	*B*	*A*	*B*	*A*	*B*	*A*	*B*
10	44	0	24	4	18	0	3	0	10	0	7	0
20	45	23	192	62	12	0	6	2	2	0	1	0
30	24	16	60	34	6	0	0	0	1	0	2	2

Column *A* shows the total microscopic organisms, in standard units per c.c.
Column *B* shows the glenodinium, in standard units per c.c.

TABLE II—DIFFUSION OF CHLORINE

Depth, Ft.	Residual Chlorine, P.P.M.
Surface	0.07—0.15
5	0.09—0.14
10	0.09—0.14
15	0.13—0.15
20	0.07—0.21
25	0

TABLE III—TOTAL MICROSCOPIC ORGANISMS IN STANDARD UNITS PER C. C.

Reservoir Level	Aug. 18	Aug. 26	Sept. 1	Sept. 8	Sept. 15	Sept. 22	Sept. 29
Top	147	403	114	87	31	19	136
10 ft.	45	324	119	60	70	6	173
15 ft.	...	...	41	22	26	0	93
20 ft.	66	23	13	38	4	28	14
30 ft.	1	0	0	0	...	...	...
Bottom	2	0	0	0	13	0	0

TABLE IV—NUMBER OF DINOBRYON IN STANDARD UNITS PER C.C.

Reservoir Level	Aug. 18	Aug. 26	Sept. 1	Sept. 8	Sept. 15	Sept. 22	Sept. 29
Top	86	352	102	53	23	9	26
10 ft.	28	250	89	40	34	1	34
15 ft.	...	...	33	16	9	0	20
20 ft.	38	6	11	18	1	5	0
30 ft.	0	0	0	0	...	...	...
Bottom	0	0	0	0	6	0	0

On Aug. 27 dose was increased to 50 lb. per day.
On Sept. 22 dose was decreased to 15 lb. per day.

TABLE V—RESIDUAL CHLORINE AT VARIOUS DEPTHS, SEPT. 2

Depth, Ft. Surface	Range of Residual Chlorine in P. P. M.	Depth, Ft. Surface	Range of Residual Chlorine in P. P. M.
5	.08- .10	17	.14
10	.07- .10	12½	.05
15	.11- .12	18	0

Good distribution of chlorine by this method leads to the belief that a method of continuous control can be evolved, especially for small towns which have but one reservoir. Ordinarily, copper-sulphating means that the reservoir cannot be used for several days. It is quite possible that, by installing a chlorinator at some convenient point well back of the intake, natural currents in the water will distribute the chlorine effectively throughout the zone of circulation and also that of transition. The chlorinator need only be used at certain times well in advance of the ordinarily troublesome season.

The chloride of lime dosage of 10 to 15 lb. per day was continued throughout the next month. However, on Aug. 18 the microscopic organism count began to climb. This time dinobryon was beginning to develop. On Aug. 26 the count was so high that the Pulaski water department was advised by telephone to increase the dose to 50 lb. per day until further notice. This was done, and on Sept. 1 the count was reduced to a third or less, and by Sept. 22 to negligible number. On that day the chlorine dose was cut down to the original amount. On Sept. 29 this reduction was reflected by the increase in organisms. But by that time it was felt that the cold weather would inhibit the growth of the objectionable organisms, which it did. (See Tables III and IV.)

Incidentally, the Charlottesville reservoir water was examined on Sept. 9. This water had a very pronounced fishy odor and taste. Among the microscopic organisms were 615 standard units per cubic centimeter of dinobryon, 48 of synura and 18 per cent glenodinium. Therefore it seems that the Pulaski reservoir was treated in time to prevent the same condition noticeable at Charlottesville.

A chlorine test of the water in the reservoir on Sept. 2 showed chlorine at the furthermost reach of the reservoirs, where the brooks emptied into it, about one-half mile back of the dam. Table V records the amount of chlorine available at the various depths. The dissolved oxygen tests made on Sept. 1 show 1.92 p.p.m. at 15 ft. depth and 0.20 p.p.m. at 20 ft.

A sample of water from the surface was tested for manganese, since it was thought that manganese was in-

terfering with the test. However, only a trace was found. A sample of water taken from the reservoir was allowed to age. After a few days the chlorine had been used up and no chlorine was found. This indicated that no interference with orthotolidine had occurred.

The distribution of chlorine noted in these tests, evolved by the natural currents due to wind and temperature, leads one to believe that continuous control of algæ may be achieved by chlorinating at some convenient point well back of the intake. The natural currents will then distribute the chlorine effectively, not only throughout the zone of circulation but also in the transition zone. The chlorinator need only be used at certain times well in advance of the season that ordinarily gives trouble.

Disputes on Public Works Contracts

—*How Can They Be Settled?*

Two articles showing the need of just procedure in settling differences arising between contractor and engineer and indicating a possible solution

WHAT CHANCE does a contractor have to secure a fair settlement of disputes arising between himself and the engineer on a public works contract? Recourse to law—slow, expensive and generally unsatisfactory as it may be—is denied him on most state and all federal contracts. On other public works construction, what is there to protect the engineer from the wily contractor who submits a deluge of doubtful claims in an effort to boost his profits? Satisfactory relations on public projects have been maintained by and are dependent, for the most part, upon the sense of fairness of the engineer and the willingness to cooperate on the part of the contractor. But it is impossible to write specifications that at times are not susceptible of various interpretations. It is not possible always to foresee all conditions to be encountered in the prosecution of the work and to take care of them in the contract. In the inevitable disputes that arise on such occasions each party naturally has his own interests to protect. The first of the following two articles points out the procedure necessary to follow in presenting claims against the various states. In some states nothing can be done to collect a claim; in others the contractor is at the mercy of one or more persons and without the right of appeal. The article raises the question of what can be done to remedy the situation. A possible solution is given in the second article, which is devoted to arbitration. As described in this article, arbitration goes beyond state work; it includes construction done for every political division from municipal to federal jurisdiction.

—EDITOR.

* * *

Statutory Provisions Relating to Claims Against State Governments

Brief summary of allowable procedure in presenting and enforcing claims in each of the 48 states

By P. D. CASE
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New York City

THE PROCEDURE of presenting and enforcing claims against the various state governments varies widely. A review of the laws of all states, made by the Raymond Concrete Pile Co., reveals that in a great many instances it is impossible to sue the state, and in some cases no provision has been made for the settlement of any claims a contractor may have against the state. Six states can be sued, but only as an appeal from decisions by the auditor or a board of examiners. One state allows suit to be brought against the highway board; another allows claims to be brought before the state courts, which can only recommend adjustment to the auditor. The decision of an auditor or board is final in deciding claims in fifteen states. In eleven others decisions of the auditor or board may be appealed to the state legislature. Final action on claims is determined in nine states by the legislature considering recommendation of the author, a board of examiners or the courts. In five states no provision whatsoever has been made to handle claims.

The following gives a brief summary of procedure in the various states:

Alabama—The state cannot be sued, and no provision whatsoever is made for the presentment or enforcement of claims.

Arizona—The state cannot be sued, but verified claims may be presented to the state auditor, whose decision and settlement is final.

Arkansas—The state cannot be sued. Verified claims may be presented to the state auditor for settlement, and if any interested party is dissatisfied with the decision, the claim is referred to the General Assembly for its final disposition.

California—Claims must be filed with the state board of examiners, and if disallowed in whole or in part by the board, suit may be brought in any of the courts of competent jurisdiction.

Colorado—The state cannot be sued, but verified claims may be presented to the auditor. If the claimant is dissatisfied with the auditor's decision, the claim is referred to the general assembly for final disposition.

Connecticut—The state cannot be sued, and claims must be presented to the state board of control, which has final disposition of the claim.

Delaware—The state cannot be sued. Claims shall be made to the office, board, commission or department through which the obligation shall have been incurred, and if the body approves, the claim shall be certified to the state treasurer for payment. There is no provision for appeal in case of dissatisfaction.

Florida—The state cannot be sued, and all claims must be presented to the state comptroller, who has final decision in approving or disallowing the claim.

Georgia—The state cannot be sued, and no provision whatsoever is made for the enforcement of claims except those against the state highway board. This board may be sued on obligations incurred by it.

Idaho—The state cannot be sued. Claims may be filed with the state auditor for settlement by the board of examiners. If the claimant is dissatisfied with the decision of the board, he may, by decision, present the claim to the Supreme Court. Its decision is merely recommendatory to the legislature for final disposition.

Illinois—The state cannot be sued. Claims against the state may be brought in a court of claims, and decisions of this court amount merely to recommendations to be submitted to the state legislature for final disposition.

Indiana—Claims against the state arising at law or equity out of contract may be enforced against the state by suit in the Superior Court of Marion County. The auditor has the duty to examine and liquidate all other claims against the state where provision for payment has been made by law; and in cases where no such provision, or an insufficient one, has been made, the case is referred to the state legislature with an opinion by the auditor.

Iowa—The state cannot be sued, but claims may be presented to the state board of audit for final decision. No claim shall be audited where such claim exceeds the amount appropriated for any department or office of the state.

Kansas—The state cannot be sued. Claims must be presented to the state auditor, who may make payment only of obligations incurred by acts of the legislature or contracted against the state by the governor, secretary of state, treasurer or board of administration, and for which specific appropriations have been made. There are no other provisions for the presentment of claims against the state.

Kentucky—The state cannot be sued. Claims may be presented to the circuit court of Franklin County, but it appears that the order of the court is merely a recommendation that the amount of the claim be made. No other provision has been made for the enforcement of claims.

Louisiana—The state cannot be sued, and claims must be presented to the auditor. Dissatisfaction with the auditor's decision means that he shall present his decision to the General Assembly for final action.

Maine—The state cannot be sued, and no provision whatsoever is made for the presentment or enforcement of claims.

Maryland—The state cannot be sued, and no specific provision is made for the presentment of claims. Apparently, claims should be presented to the state treasurer, as an article in the code provides that when any claim is made against the state the treasurer may set off against that claim any amount that the claimant may owe to the state.

Massachusetts—The commonwealth may be sued, the superior court being given jurisdiction of all such actions. No execution may issue against the state upon the decision of the court.

Michigan—The state cannot be sued. All claims against the state shall be presented to the auditor general or a board of auditors, depending upon their nature, and disposition by the auditor or by the board is final.

Minnesota—The state cannot be sued, but claims may be presented to the state auditor. If the claimant is dissatisfied with the auditor's decision, he may appeal to the state comptroller, whose decision is final.

Mississippi—The state cannot be sued, and no provision has been made for the presentment of claims.

Missouri—The state cannot be sued, but claims may be presented to the state auditor. If the claimant is dissatisfied with the auditor's decision, the auditor shall refer the case to the General Assembly for final disposition.

Montana—The state cannot be sued. All claims must be presented to the board of examiners, and the board's decision is then reported to the state legislature as a recommendation.

Nebraska—The state may be sued in such manner and in such courts as the legislature shall by law direct. It has been held that this provision has been sufficiently supplemented by statute to permit an action against the state on contract.

Nevada—The state cannot be sued, but claims may be presented to the board of examiners. In the case of obligations authorized by law and where an appropriation has been made, the decision of the board is reported to the comptroller. In cases of claims for which no appropriation has been made, the board will forward the petition together with an opinion to the legislature for disposition.

New Hampshire—The state cannot be sued, and no provision whatsoever is made for the presentment or enforcement of claims against the state.

New Jersey—The state cannot be sued. Claims should be presented to the comptroller of the treasury, who has the power to audit, adjust and settle all claims and report the amount allowed to the state treasurer for payment.

New Mexico—The state cannot be sued, but claims may be presented to the state auditor. He then presents the claim with his opinion thereon to the legislature for disposition.

New York—The state may be sued in the court of claims, and appeal may be taken to the appellate division.

North Carolina—The state cannot be sued except as follows: the constitution gives the Supreme Court original jurisdiction to hear claims against the state. Its decision is recommendatory, and no process in the nature of execution may issue thereon, and the decision of the court is reported to the next session of the General Assembly for action.

North Dakota—The state may not be sued except as noted. All claims must be presented to the auditor. The constitution provides that suits may be brought against the state in such manner, in such courts and in such cases as the legislative assembly may by law direct. The only instance in which the legislature has sufficiently supplemented this to permit suit against the state is in connection with the operaton by the state of the North Dakota Mill and Elevator Association.

Ohio—The state may not be sued, but claims may be submitted to the state auditor for audit and settlement.

Oklahoma—The state cannot be sued. All claims must be presented to the state auditor.

Oregon—The state cannot be sued, and it is the duty of the secretary of state to examine and determine all claims against the state. He may draw a warrant on the state treasurer in payment of claims approved.

Pennsylvania—The state cannot be sued. Claims must be presented to the state auditor general, who shall audit the claim and report on it to the legislature for final action.

Rhode Island—The state cannot be sued. Claims should be presented to the auditor, and his decision is reported to the treasurer.

South Carolina—The state cannot be sued, but claims may be presented to the court of claims. The court's decision is reported to the ways and means committee of the House of Representatives, which committee may then make provision for payment of the claim in the general appropriation bill.

South Dakota—The state cannot be sued, and claims must be presented to the auditor for audit and settlement.

Tennessee—The state cannot be sued. Claims must be presented to the state comptroller.

Texas—The state cannot be sued. Claims must be presented to the comptroller, and the auditor's report of the claim is referred to the next meeting of the legislature.

Utah—The state cannot be sued. Claims must be presented to the state board of examiners, and the board's decision on the claim and recommendation in regard thereto is reported to the state legislature for action.

Vermont—The state cannot be sued. Claims must be presented to the committee on budget, whose report on the claims and its recommendation are submitted to the legislature.

Virginia—Claims must be presented to the auditor of public accounts, and where a claim is disallowed by the auditor, the claimant may petition the circuit court of the city of Richmond. The judgment or decree of the court is nothing more than a recommendation that is presented to the next meeting of the legislature, and no decree or judgment against the commonwealth may be paid without a special appropriation being made therefore by law.

Washington—Claims should be presented to the auditor. If disallowed by him, suit may be commenced against the state in the superior court of Thurston County. No execution can issue against the state on a judgment against it. A certified copy of the judgment is filed with the auditor, who is authorized to make payment.

West Virginia—The state cannot be sued. Claims should be presented to the auditor, and if disallowed in whole or in part by him, may be, by petition, presented to the circuit court of the county in which the seat of government is located to have such claim audited and settled. The amount found

due shall be reported to the state auditor, who in turn shall report the decision to the state legislature. The claim may be paid only after a special appropriation has been made by the legislature.

Wisconsin—Any claim which the legislature has refused to allow may be made a basis of a suit against the state by filing a complaint with the clerk of the Supreme Court. The Supreme Court shall hear the case unless it deems a trial by jury advisable, in which event the case is referred to the circuit court to be tried at a regular jury trial. In such case, the verdict is reported to the clerk of the Supreme Court, upon which the Supreme Court enters judgment. Judgment of the Supreme Court is final and conclusive. No execution can issue against the state. A transcript of the judgment is filed with the secretary of state, who may direct payment out of the treasury.

Wyoming—The state cannot be sued. Claims must be filed with the auditor, and if the claimant is dissatisfied with the auditor's decision, the auditor shall certify his decision to the legislature for final action.

In many states the constitution provides that the legislature shall direct by law in what manner suits may be brought against the state. The legislatures have never made any provision for such suit, and consequently these states cannot be sued.

Arbitration as Applied to Public Works Construction

Advantages to both parties in settling disputes by presentation before board of experts

By CHARLES H. STEVENS
Chief Engineer, Department of City Transit, Philadelphia, Pa.

ARBITRATION may be defined as a method of settling differences between parties to a dispute without resort to litigation. The adoption of arbitration in the United States has been very slow due to the lack of authoritative legislation, and it was not until 1920 that the state of New York passed a statute making valid, irrevocable and enforceable agreements to arbitrate disputes arising out of written contracts. This New York law was followed by similar legislation in Arizona, California, Connecticut, Louisiana, Massachusetts, New Hampshire, New Jersey, Oregon, Pennsylvania and Rhode Island; and bills have been introduced for the same purpose in the legislatures of Colorado, Montana, Ohio and Texas. The federal arbitration act of 1925 extended the application of arbitration to interstate commerce, maritime transactions and matters within the jurisdiction of the federal courts. More than 30 other states have arbitration laws of one form or another, which, however, relate only to the arbitration of *existing* disputes. The provisions of these latter state laws vary considerably and in some instances require compliance with burdensome technicalities.

Arbitration on public works contracts differs somewhat from ordinary commercial arbitration. It involves granting permission to the contractor to appeal from a decision of the engineer, which would otherwise be final, rather than merely providing a method for adjusting disputes in a commercial transaction that has required no more skill, knowledge or responsibility of one party than of the other. For this reason arbitration on public works has not as yet made very substantial progress.

Public officials charged with the administration of contracts for public works, whether they are engineers or men without technical training, are closely hedged about by legislative enactments, governmental or charter requirements, established precedents, public opinion, and, in some cases, by political influence. They are, as a class, reluctant to submit to arbitration differences of opinion arising between themselves and contractors.

The American Institute of Architects, in its standard form "The General Conditions of the Contract," issued in 1915, incorporated an article providing for arbitration. This form has been indorsed by the associated building trades and is in general use throughout the country for building contracts. The American Society of Civil Engineers maintained for several years a special committee on arbitration, which was charged with the study of arbitration laws passed by Congress and by several of the states. Upon the recommendation of this committee the society has approved a code of rules for the conduct of arbitration proceedings, drafted and published by the American Arbitration Association, an organization composed of public-spirited men and women, with headquarters in New York City. The association has done much to promote the adoption of uniform arbitration laws throughout the United States by the submission of a model arbitration act, based on the federal arbitration act, to the various state legislatures.

Legal Status

With respect to the question of whether a specific state law is necessary to permit a state or a political subdivision thereof to arbitrate disputes, there are two views. One view is that specific legislation is necessary. Judge Dillon, in his work on municipal corporations, indicates what appears to be the prevailing view in the following words:

> As a general proposition, municipal corporations have, unless specifically restricted, the same powers to liquidate claims and indebtedness that natural persons have; and from that source proceeds power to adjust all disputed claims, and, when the amount is ascertained, to pay the same as any other indebtedness. It would seem to follow therefrom that a municipal corporation, unless disabled by positive law, could submit to arbitration all unsettled claims with the same liability to perform the award as would rest upon a natural person, provided, of course, that such power be exercised by ordinance or resolution of the corporate authorities.

Arbitration Experience

In Philadelphia a commission composed of prominent business men was appointed by the mayor in 1928 to study and report on the administration of municipal contracts. This commission recommended the standardization of contract requirements and the inclusion in all contracts of a provision for arbitration. The department of city transit is as yet the only branch of the municipal government that has adopted an arbitration clause. Up to the present time resort to arbitration has been found necessary by the department only once, although 45 contracts for subway construction and equipment, totaling $30,000,000, have been awarded by the department under specifications providing for such arbitration.

In the case referred to, the points at issue involved the propriety of the department's rejection of the contractor's method of procedure and the question of payments under such method, the differences of opinion being largely due to differences in interpretation of the plans and specifications. The matter was submitted to a board of arbitra-

An abstract of a paper presented before the highway division, American Society Civil Engineers, Norfolk, Va., April 16, 1931.

tion consisting of three engineers. This board rendered a decision favorable to the contractor, and the findings have been submitted to the Common Pleas Court and been confirmed thereby. The decision of the arbitrators, while adverse to the city, provided an interpretation of the specifications which, when confirmed by the court, made it possible for a satisfactory agreement to be reached and brought about the resumption of work.

The Iowa state highway department is said to have had marked success with an arbitration clause that has been in use there for considerable time. According to a recent statement of its chief engineer there have been but eight cases submitted to arbitration in almost as many years. This he credits to the fact that his engineers have been more reasonable in their demands than when no appeal could be made from their decisions.

Advantages of Arbitration

Serious differences of opinion arise between contractors and engineers on public works, and at times these disputes lead to a complete cessation of work by the contractor pending litigation or the working out of some other method of settlement. Recourse to litigation, with its attendant delays due to the congestion of court dockets, expense and the necessity of observing arbitrary rules in the presentation of evidence, is generally unsatisfactory to both parties at issue. Cases of this nature require a technical knowledge on the part of judge and jury that is rarely found, and a skilled advocate can often misrepresent the justice of his client's position so plausibly that a decision is handed down favorable to such client, although contrary to the merits of the case.

It has been said that there are three things essential to a just decision—namely, integrity, intelligence and a knowledge of the issue; and that if the last is lacking, in spite of a man's integrity or intelligence, it is impossible for him to properly pass on such a question. Decisions rendered by one or more arbitrators having an expert knowledge of the questions involved should prove more satisfactory. In the case of construction contracts the points most liable to be disputed are the interpretation of plans and specifications, questions of payments and other questions involving elements of time and money. Arbitration is especially desirable on these questions, as they are usually outside the knowledge of the judge and jury.

The advantages of arbitration over litigation may be set forth as follows: (1) Intelligent decisions may be expected from arbitrators who are familiar with the subject matter; (2) the merits of the case alone should determine the decision, whereas court decisions may and often do hinge on technicalities of law; (3) the presentation of evidence is not likely to be hampered as in court procedure; (4) publicity and hard feelings engendered by trials are avoided; (5) prompt agreements can be arrived at; (6) the cost is generally less, and, if so provided, the work may be prosecuted continuously during the arbitration proceedings.

Arbitration of questions arising in contracts for public works is often the only method by which the contractor can seek redress, as he is generally unable to sue without the consent of Congress or of the legislature, if the public work be for the federal or state government. Failure to provide fair means by which contractors can appeal to disinterested, qualified judges for relief from arbitrary decisions on the part of the engineer may be reflected in the increased cost of the work or in the abstinence on the part of dependable skilled contractors from submitting bids for public works.

Arbitration furnishes a satisfactory means of adjusting disputes on matters involving the elements of time and money and on all other matters, except questions as to quality of materials or workmanship, and its general adoption on public works will place our contract procedure in step with the developments of the times.

Discover Old Boat That Reached Boulder Dam Site in 1858

By H. M. ROUSE
Engineer Colorado River Land Co., Calexico, Calif.

THE HULL of the old boat "Explorer," used by Lieutenant Ives in 1858 to ascend the Colorado River as far as the site of the Boulder Dam, recently was discovered after being lost since 1864. Practically buried in the sand of the Colorado River delta, the 73-year old relic was found about 12 miles below the

Relic of early boat trip to Boulder Dam site

Arizona line and several miles from the present river because of the 1909 shift in the channel.

The entire hull is intact, and the portion above ground is apparently of the original $\frac{5}{8}$-in. thickness. It measures 45½ ft. long, 13½ ft. wide and 3 ft. deep amidships. Best proof of identity is established by patches in the stern plates. These patches, according to the Ives report, were necessary to prevent shipping water through notches which had been cut for the connecting rods when the boat was tried out on the Delaware River.

The Lieutenant Ives expedition was a result of the government's interest in ascertaining the navigation possibilities on the river, following earlier explorations by Captain Sitgreaves and Lieutenant Whipple. Unable to charter one of the steamboats then in service on the lower Colorado River at a price within his budget, Lieutenant Ives ordered the construction of a boat at Philadelphia in 1857. It was built in eight sections to permit dismantling and was shipped to San Francisco via the Panama route. It was then reshipped to the mouth of the river and assembled in December, 1857. During the early months of 1858 it was used to make the exploration trip to determine the practicable head of navigation. This point, the lieutenant decided, was Black Canyon (approximately at the Boulder Dam site)—a logical decision, since it took him five days to travel the last 20 miles upstream.

Arizona history records that the old boat was used in 1864 to haul wood out of the Gila River. On reaching the Colorado it became caught in cross-currents and abandoned. Apparently all records of the boat were lost from that year until its recent discovery.

The Golden Gate Bridge

Structural details of a suspension bridge with a main span 700 ft. longer than the Fort Lee bridge at New York, incorporating definite provisions for resisting earthquake forces

ON JUNE 17 bids will be received on what is to be the longest bridge in the world. This is a highway structure spanning the Golden Gate, entrance to San Francisco Bay, and connecting San Francisco County with Marin County and the district north of the bay, hitherto accessible only by ferries. The bridge is to be of the suspension type with a main span of 4,200 ft. and suspended side spans of 1,125 ft. Its main span, therefore, is 700 ft. longer and its side spans 475 ft. longer than the corresponding portions of the record-breaking Fort Lee bridge over the Hudson River in New York. The Golden Gate bridge will be built from the proceeds of a public bond issue and will be operated on a toll-refunding basis. Actual construction will begin this summer.

The bridge is to be built by a benefit district organization known as the Golden Gate Bridge and Highway District, formed under an act of the California legislature in 1923, which authorized the formation of special assessment districts that could be taxed for the purpose of local improvements. The Golden Gate Bridge and Highway District includes six counties—San Francisco, Marin, Sonoma, Napa, Del Norte and Mendocino—and its work is administered by a board of appointed directors. The engineering organization consists of a chief engineer, Joseph B. Strauss, of Chicago, and a board of three consultants, O. H. Ammann and Leon S. Moisseiff, of New York, and Charles Derleth, Jr., dean of the engineering school, University of California.

On November 4, 1930, a $35,000,000, 5 per cent bond issue was approved by the voters of the district, these bonds to be secured not only by bridge earnings but by unlimited taxes on all property in the district, 85 per cent of the value of which is located in the city of San Francisco. The bonds are to be retired in 40 years from earnings (based on a five-year construction program), at which time the state may take over the bridge and operate it free of tolls. The estimated cost of the bridge is $32,815,000, but because of questions raised as to the accuracy of the estimate and consequently the adequacy of the bond issue to cover the actual cost of construction, bids are going to be received before the bonds are sold. It is proper to point out that the apparently low estimate results largely from the fact that practically no real estate cost is involved. Both approaches are located in government reservations over which free easement has been granted. The directors of the district have pledged that unless the total for all contracts comes within the $35,000,000, no contracts will be awarded until the approval of the voters is secured. This plan of receiving bids before any money is actually available comprises one of the unique features of the project. Preliminary expenses and engineering fees in an amount of approximately $300,000 have been advanced by the district from a fund created from special taxes.

Like all great bridge projects the Golden Gate bridge has a long historical background. It was not until 1923, however, when the so-called bridge and highway benefit district act was passed, that much progress was made toward a definite project. At that time private promoters proposed a bridge with a 4,000-ft. main span, consisting of two 900-ft. cantilever arms carrying a cable suspension span of 2,200 ft. In the meantime, the constitutionality of the benefit district law was fought through the courts, finally being upheld in the U. S. Supreme Court about a year ago. The present board of engineers was appointed in the summer of 1929. War Department approval was easily secured, because the depth of the water in the center of the channel (nearly 300 ft.) would permit the bridge, should it be wrecked by enemy forces, to sink below any point where it would interfere with naval maneuvers in and out of San Francisco Bay.

Preliminary work, including borings, was completed in the spring of 1930, and now the final design has been developed to a point where plans can be released for bids. In the recent call for bids the work was listed in

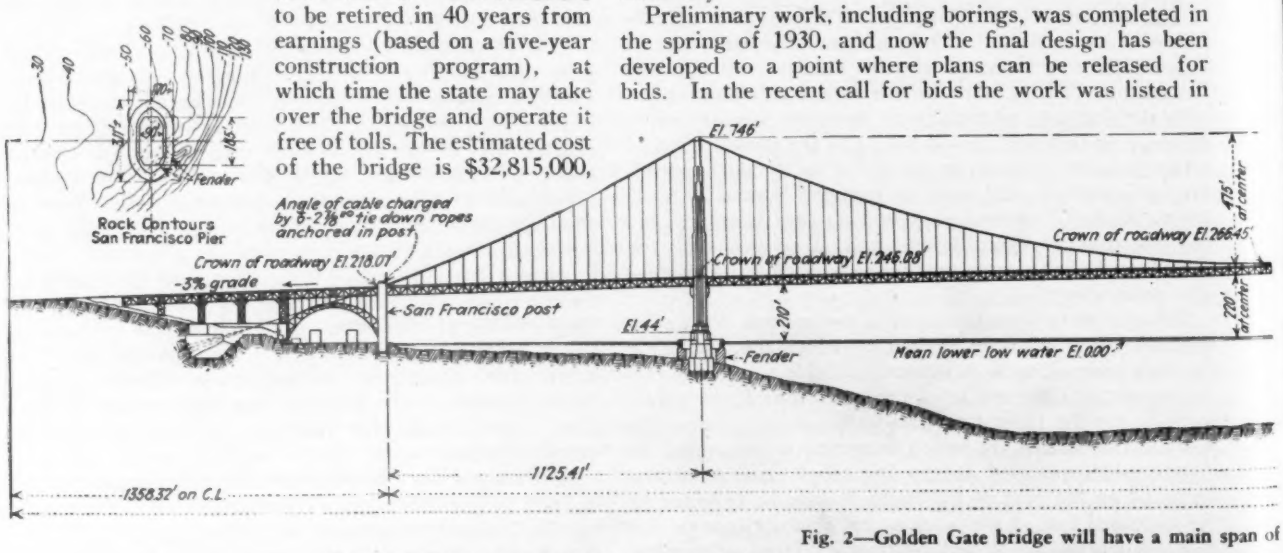


Fig. 2—Golden Gate bridge will have a main span of

Piers are sunk 25 ft. into rock to preclude sliding in case of earthquake. For the same reason towers are

eleven separate contracts as follows: No. 1, superstructure, 75,000,000 tons of structural steel and 28,000 tons of cables and fastenings; No. 2, main piers; No. 3, anchorages; No. 4, San Francisco and Marin approach spans; No. 5, Presidio road; No. 6, Sausalito road; No. 7, paving main approach spans; No. 8, electric work; No. 9, cable housing and stairways, filling and grading; No. 10, toll terminals; and No. 11, cement.

Fig. 1—Location of Golden Gate bridge

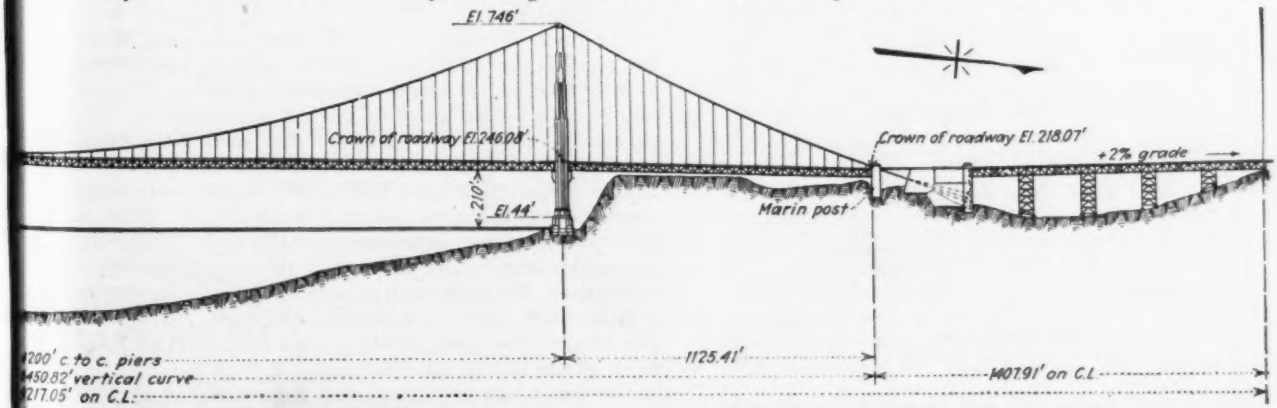
General Design

During the detailed study given to the design of the bridge the combined cantilever and suspension design was dropped, and the superstructure plans that are now available show a suspension bridge with a 4,200-ft. main span and two equal suspended side spans of 1,125 ft. Steel viaduct approaches connect the main bridge with high ground about 1,400 ft. inland at each end; in order to avoid any changes in the fortifications at the Presidio near the San Francisco anchorage, the approach is carried over on a steel-arch truss span, which is given such a rise-to-span ratio that it will mask the backstay cables. The bridge is 90 ft. wide between stiffening trusses, providing for a 60-ft. roadway and two 11-ft. sidewalks, carried at the top-chord level of the trusses. Two parallel-wire cables 36½ in. in diameter, having a steel area of 830 sq.in., are provided. Towers are of steel of the fixed-based flexible type, with cables fixed to the tower tops after erection. The towers, with cellular section legs braced by struts but with no diagonal bracing, are 699 ft. 8 in. tall from pier top to center of cables. Stiffening trusses are of simple design, rocker-arm connected at the towers, with 25-ft. square panels and suspender-cable connections placed at every second panel point. Gravity anchorages are provided. Posts are placed at the shore end of each side span to support the end of the stiffening truss and to stay the cable at that point. The San Francisco post is 140 ft. high of reinforced concrete. A steel tower 30 ft. high is planned for the Marin post.

As shown in Fig. 1, the bridge is located at a point north of the city of San Francisco where two arms of land jut out into San Francisco Bay, forming the Golden Gate. These arms are some 5,300 ft. apart, requiring that at least one pier be a considerable distance offshore, if a span of approximately 4,000 ft. should be used. On the north or Marin County end, borings disclosed a compact greenstone or diabase. A projecting ledge of this formation furnished a particularly suitable pier location, which could be utilized by increasing the span length to 4,200 ft. and still maintaining the south or San Francisco pier in not more than 65 ft. of water, which was desirable. At the San Francisco pier site, foundation materials were not so satisfactory, although a shelf of rock with only a gradual slope from the land outward some 1,300 ft. permitted considerable latitude in pier location. Borings disclosed the material in this shelf to be a serpentine that has "suffered internal shearings, so that it now consists of an aggregate of ellipsoids or spheroids of strong rock embedded in a matrix of sheared rock (indicated as hydrated serpentine on the boring plans) of very small strength." However, this material was found capable of supporting a test load of 33 tons per square foot and was, therefore, adjudged satisfactory. Borings at the San Francisco anchorage disclosed a similar formation of serpentine with a 20-ft. overburden of clay and disintegrated rock. At the Marin anchorage a 10- to 15-ft. layer of clay is underlaid by sandstone. At the present time additional borings are being made at the San Francisco pier site. To date, four holes have been completed and show satisfactory serpentine.

The design of the main piers is shown in Fig. 3. Because the site of the bridge parallels the San Andreas fault, which is only about 6 miles distant, both piers are to penetrate about 25 ft. into the rock foundation so as to preclude any tendency to slide in case of an earthquake. Another design feature, dictated by the possibility of earthquakes, is the provision for anchoring the towers to the piers by means of a structural-steel cage 17½x49 ft. in plan and 52½ ft. deep, embedded in the pier under each tower leg.

The Marin pier consists of a block of concrete 160x80



ft., **700 ft. longer than the Fort Lee bridge at New York**

ned for **horizontal loads approximating 7 per cent of the vertical loads and are securely anchored to the piers.**

ft. and 65 ft. high. Being located near land, its construction will consist merely of a rock-excavation job in open cofferdam. The San Francisco pier, however, is located 1,125 ft. offshore in 55 to 65 ft. of water, on a site exposed to rough seas, tidal currents of nearly 8 miles an hour and a tidal range of 9 ft. It is 185x90 ft. in plan and 144 ft. deep, resting on the serpentine rock at 100 ft. below the water surface. Although the possibility of successfully constructing this pier in an open cofferdam was recognized, it was deemed expedient to require the use of a compressed-air caisson in order to make certain that the rock can be fully exposed and all concrete placed in the dry.

The method proposed for constructing the San Francisco pier deserves emphasis. Foreseeing the ultimate necessity for fenders around this pier, the designers decided to utilize the fender structure as an inclosure for pier-sinking operations. Accordingly, the fender is to be built of reinforced concrete with gravity-wall sections 27 ft. thick at the base. Virtually, it provides an elliptical-shaped cofferdam with maximum diameters of 170 and 311 ft. Upon completion of the fender structure it will be partly filled with sand (in effect creating an artificial island) through which the air caisson will be sunk.

Anchorages

Both anchorages are to be of the gravity type. Original plans contemplated tunnel anchorages, but detailed study of this type proved them to be too expensive, especially on the San Francisco end, where excavation would have encountered the shattered serpentine rock. The possibility of earthquakes also militated against the use of tunnel anchorages. There was the additional factor that the use of tunnel anchorages would have required costly cable bents at each end, and at the San Francisco end would have necessitated alterations to an old fort; the adopted gravity anchorage is located behind the fort, with the cables clearing the buildings overhead.

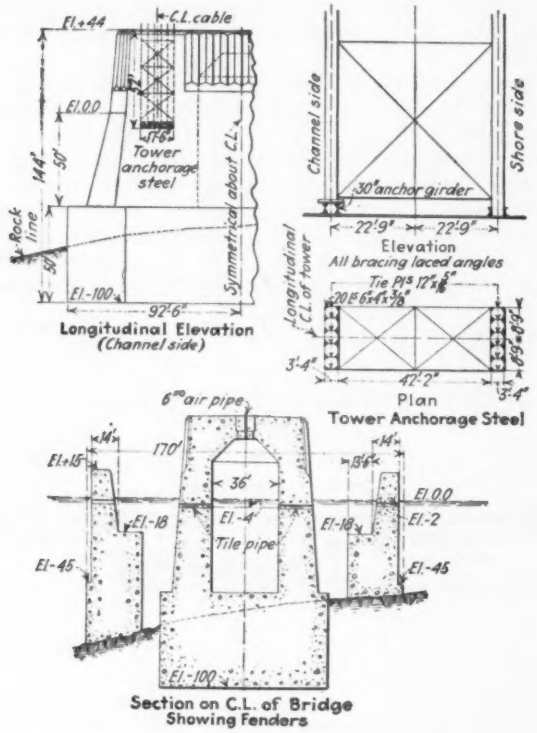


Fig. 3—San Francisco pier will be sunk by air inside of an open cofferdam formed by the fender structure

Detail shows the steel frames used to anchor the towers to the piers against earthquake forces.

Cables and Suspenders

The cables are of slightly larger size than those used on the Fort Lee bridge at New York. The comparative steel sections are 830 and 800 sq.in., respectively. Only two cables are to be used on the Golden Gate bridge, while the Fort Lee bridge utilizes four. The Golden Gate cables are about 36¼ in. in diameter after compacting, made up of 27,572 galvanized wires (0.192-in. diameter before galvanizing) arranged in 61 strands of 452 wires each, as compared with 26,474 wires in each Fort Lee cable, also arranged in 61 strands. The cable sag is 475 ft., giving a span-sag ratio of 8.84:1. Each suspender consists of two 2⅞-in. wire ropes terminating at the top in a wire-rope sling that passes over the cast-steel cable clamp; at the bottom the suspender ropes are attached to the flanges of the top chord of the stiffening trusses by button connections. Suspenders are spaced 50 ft. apart along the cable, as compared with 60 ft. on the Fort Lee bridge and 20 ft. on the Philadelphia-Camden bridge. At the end of the side spans special cable clamps are provided, to which are attached tie-down cables that change the angle of the backstays to a flatter inclination, thus reducing the vertical-stress component that must be resisted by the gravity anchorages. The tower saddle and splay castings are of conventional design.

Towers—Esthetic considerations played a prominent part in the design of the towers. They are to be of steel, unincased. A cellular construction was used for the legs, with the cells arranged in such a way as to produce a ribbed surface up and down the four faces. Setbacks, caused by discontinuing a given number of cells at four different levels, accentuate the motif of angularity created by the vertical ribs. As a finishing touch, the four struts that brace the tower legs at different levels above the roadway are to be sheathed in copper-bearing sheet-steel housings, with a vertical sawtooth surface to harmonize with the vertical ribs and sharp angles of the tower legs themselves. Sheet steel is also to be used in a draped design beneath each strut, giving a definite portal effect.

As shown in Fig. 4, the cellular construction of the tower legs is relatively simple. It is required that all parts of the tower legs be shop-assembled to insure accurate fit of bearing surfaces and alignment of field-connection holes.

The tower legs, spaced 90 ft. apart, are fixed at the base. In fact, as previously stated, each leg is anchored to a structural-steel frame embedded in the top 50 ft. of the pier to insure stability against earthquakes. The towers themselves are designed for earthquake loads equaling about 7 per cent of the vertical loads. Tower stresses were determined and members and connections proportioned under an assumed deflection of 16 in. at the top of the tower, both longitudinally and transversely. The major longitudinal moment at the base of the tower under dead, live, temperature and wind loads (assuming a 16-in. deflection) is 2,246,541,000 in.-lb. The steel area of each tower leg varies from a maximum of 7,527 sq.in. at the bottom to 3,895 sq.in. at the top.

The tower legs are braced above the roadway by four trussed struts, thus eliminating diagonls, which were adjudged unsightly. Two panels of crossbracing are used between the roadway and the base of the tower. In

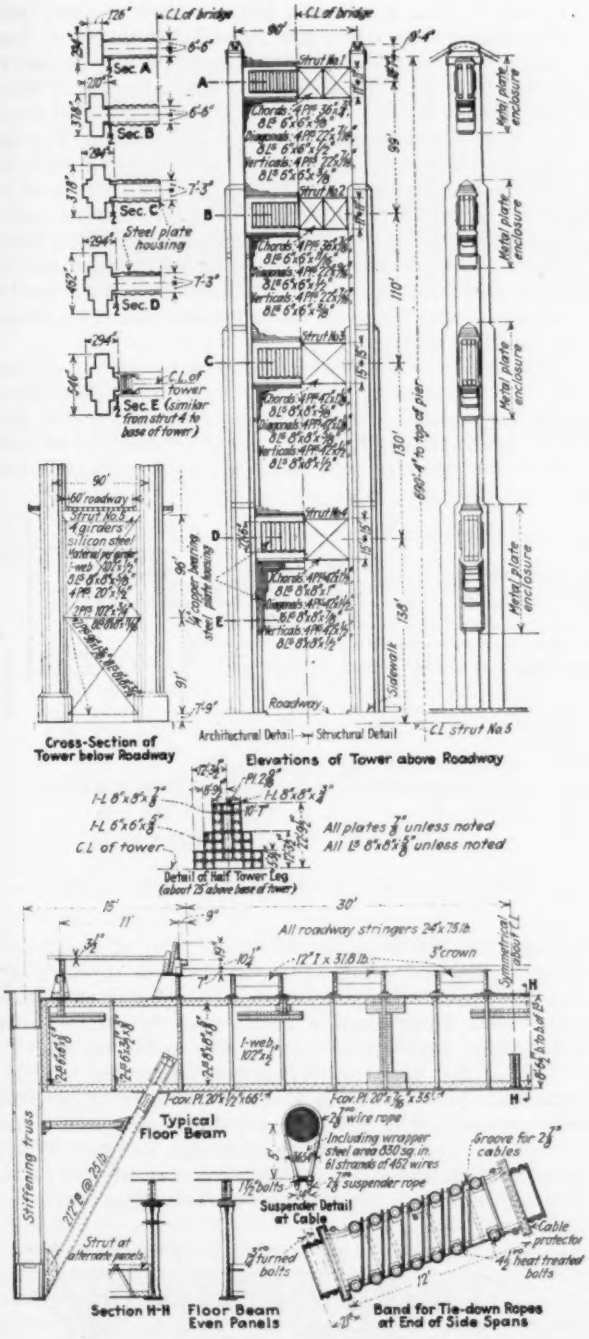


Fig. 4—Tower and floor design, Golden Gate bridge

Monumental and modernistic steel towers introduce rigid-frame design to the suspension-bridge field. Note absence of diagonal bracing above the roadway.

addition to having a considerable depth (from 22 to 30 ft.), the struts are connected to the legs by deep gusset plates in order to develop the maximum rigidity. With the exception of the upper 200 ft., which is silicon steel, the material of the tower is carbon steel.

Stiffening Trusses—As in the design of the Fort Lee bridge, the stiffening truss was not a major consideration, the great weight of cable and floor steel providing much of the required stability. The stiffening trusses of the Golden Gate bridge are of simple parallel-chord Warren type, 25 ft. deep and with panels 25 ft. long. They are braced laterally, at the top by 8½-ft. floor beams at each panel. Kneebraces extending from the floor beams to the stiffening trusses provide lateral stability in the plane of the bottom chords. Because of the great weight and consequent inherent stability of the cable of long-span suspension bridges, wind stresses in stiffening-truss chords are a maximum at the quarter point instead of at the center, as in trusses on shorter spans. Thus, on the main-span trusses of the Golden Gate bridge the required chord cross-sections are approximately 124 sq.in. at the towers, 190 sq.in. at the quarter points but only 153 sq.in. at the center.

As shown in Fig. 4, the floor system is simple, consisting of plate-girder floor beams, 8½ ft. deep at each panel, carrying 14 lines of 24-in. stringers. The pavement surface has not been determined, but it is specified that it shall not weigh more than 85 lb. per square foot, which will require light-aggregate concrete or some other special type.

Loads, Stresses and Materials—The bridge is designed for an equivalent dead load of 21,600 lb. per linear foot on the main span and 20,300 lb. on the side spans. The equivalent live load for the entire bridge loaded is 4,000 lb. per linear foot, with 500 lb. per foot added for conduits. The live load assumed for stringers and floor beams consists of four 24-ton trucks and two 50-ton street cars abreast, with 50 per cent impact added for the stringers and 25 per cent impact for the floor beams. Two sets of stringers are designed for the street-car loads, although it is not contemplated that anything heavier than trucks and buses will use the bridge.

Except in the stiffening trusses, lateral bracing, floor beams and stringers, carbon steel is designed on an 18,000-lb. basis and silicon steel on a 24,000-lb. basis. This includes the towers, which utilize silicon steel in the top 200 ft. and for the cross-strut beneath the roadway. The silicon steel chords of the stiffening trusses are designed with a unit tensile stress of 32,000 lb. per sq.in., and the carbon steel webs with a unit stress of 21,000 lb. per sq.in. For the silicon steel lateral bracing 32,000 lb. per sq.in. is used. The flanges of floor beams are silicon steel designed on a 22,000-lb. per sq.in. basis. The webs of the floor beams and the stringers are carbon steel, designed with a unit stress of 16,000 lb.

The cable wire specified is to be cold drawn, with a minimum ultimate strength of 220,000 lb. per sq.in., a yield point of 160,000 lb. and a 4 per cent elongation in 10 in. A cable stress of 82,000 lb. per sq.in. was used in the design.

Suspender ropes are required to be galvanized 2⅞ in. in diameter and made of six strands around an independent wire-rope center. They must be prestressed at the factory under a load equal to 150 per cent of the design load.

Although only structural carbon and structural silicon steel are shown on the plans, it is understood that the engineers have asked bidders to submit a price for copper-bearing steel containing a minimum of 0.2 per cent copper as an alternative for the carbon steel.

Construction Program—A construction period of approximately four years has been laid out by the engineers. This contemplates that the Marin piers will be completed March 1, 1932; the San Francisco pier and fender, Oct. 1, 1932; the essential parts of the anchorages, April 1, 1933; the steel towers, July 1, 1933; the cables, except wrapping, Sept. 1, 1934; the stiffening trusses and floor steel, Feb. 1, 1935; and the pavement, June 1, 1935.

Bridge Floor Built of Precast Concrete Slabs Secured by Welding

PRECAST SLABS of reinforced concrete, having steel lugs which are welded to the steel-deck framing, form the floor of the new Wabash Ave. 232-ft. double-leaf bascule bridge over the Chicago River. A strong but light and thin floor is thus obtained, the weight per square foot of roadway paving being about 66 lb. Individual slabs can also be replaced readily.

For each 30-ft. roadway there are two rows of large slabs 12 and 8½ ft. wide, a row of 3½-ft. slabs between the street-car rails, and a row of 2½-ft. slabs between the rail and the top chord of the middle truss. In general, these slabs are 8 ft. 6 in. long and 5¾ in thick. Those at the sides of the roadways have 4-in. curbs 3½ in. high. Each slab, reinforced by rods and stirrups, has a bottom frame of steel angles to which are riveted a number of small plates projecting up into the concrete for anchorage and projecting below the frame to form lugs, which rest on and are electrically welded to the steel beams. The largest slabs weigh about 6,755 lb. each.

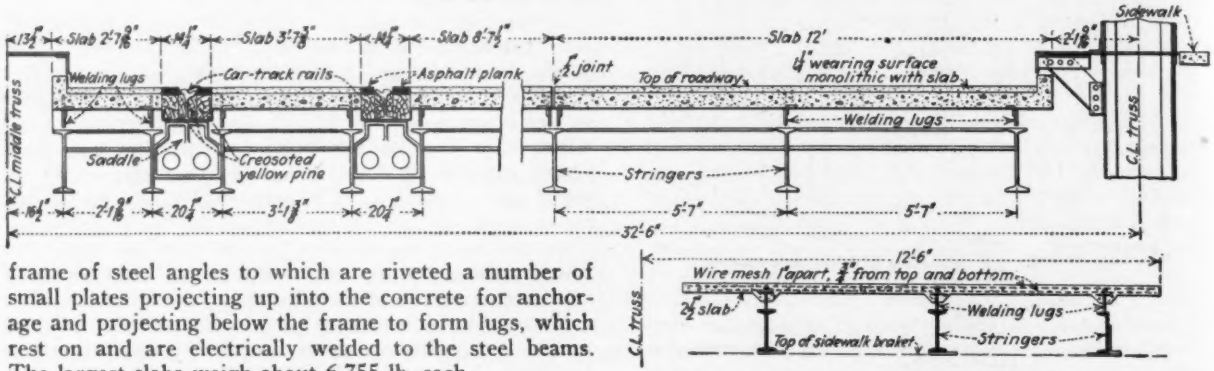
To combine strength with lightness, the concrete was made of high-early-strength cement, sand and light-weight coarse aggregate, except that granite aggregate is used in the 1¼-in. wearing surface. A groove is formed in each vertical face of the slab, and when the slabs are laid a 1-in. rope is fitted in the grooves to retain a pre-formed joint filler. All edges are rounded to ½-in. radius. The faces of the slabs are painted with asphalt before the joint filler is placed, and two coats of water-proofing are applied on the under side, the second coat being given after erection.

In the track construction grooved girder rails are bolted to cast-steel saddles riveted between pairs of I-beams in the floor framing. Creosoted yellow-pine fillers are fitted under the rail heads, and stringers of the same material fill the spaces between the rails and the concrete slabs. On each stringer is a 2-in. asphalt plank, flush with the rail head and slab.

For the sidewalks the slabs are 2½ in. thick and are of somewhat different form, with a longitudinal rib at each stringer. Embedded in the rib are short T-bars having their heads anchored by bent rods, while the stems project as lugs to be welded to the floor framing. A ¾-in. wearing surface is used.

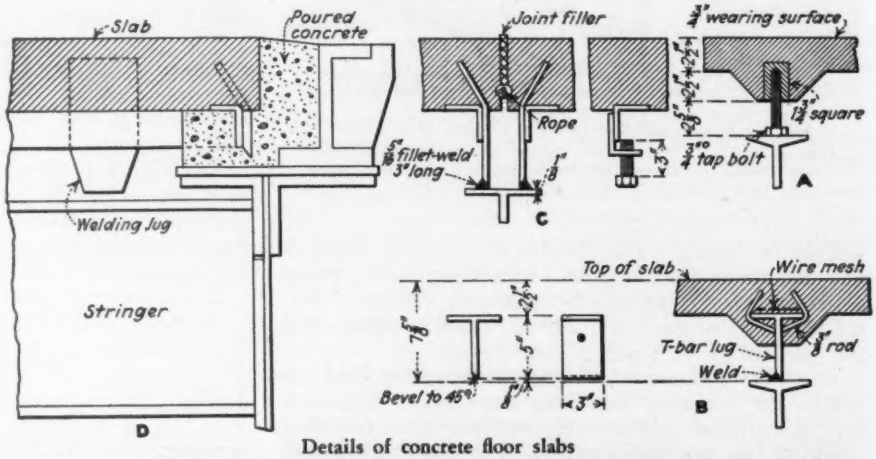
Long U-bolts or stirrups held the slabs in place until the welding was done, the loop fitting under a floor I-beam and the legs passing up through 1-in. pipe sleeves in the concrete. These sleeves were afterwards filled with cement grout. To adjust the slabs to exact level, each had four adjustment screws in the bottom. For the roadway slabs a ¾-in. cap screw passed up through an angle bracket on the steel frame of the slab, the head of the screw resting on the floor stringer. For the sidewalk slabs a ¾-in. tap bolt was screwed into an iron block embedded in the concrete, the head of the bolt resting on the I-beam stringer. The slabs, made by the Benedict Stone Co., were delivered on barges and placed by means of a floating derrick.

The roadway slabs were designed to carry a 24-ton truck (16 tons on the rear axle) with 46 per cent allowance for impact. The allowed stress was 18,000 lb. per sq.in. in the steel and 2,100 lb. in the concrete, to provide which the concrete was specified to have an ultimate strength of 6,000 lb. in 28 days. To produce this strength, the mix was 1:1½:2½, with 4½ gal of water per bag of cement. The slabs were cast in rigid forms suspended on slings from a crane, and the forms were vibrated by four electric vibrators attached to the bottom.



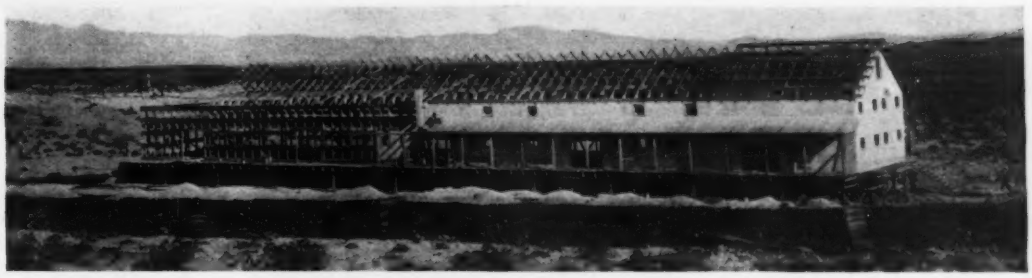
Bridge floor of precast concrete slabs welded in place

This bridge, with its novel system of paving, was designed and built under the direction of Loran D. Gayton, city engineer; Paul Schioler, city bridge engineer; and Donald N. Becker, engineer of bridge design. When opened in December it completed a new north and south thoroughfare that has relieved traffic congestion.



Details of concrete floor slabs

Detail *A*, adjustment screw supports of slabs. *B*, welding lug cut from 5-in. T. *C*, joint between roadway slabs. *D*, middle joint in floor.



The start of a temporary city that will rise out of the desert
Six Companies, Inc., warehouse at Boulder City

Activities and Conditions at Boulder Dam

Las Vegas, a frontier boom town—Hundreds of job seekers—Highway and railroad construction—Contractor blasting road to tunnel portals—Boulder City plans—Climatic conditions

Editorial Correspondence

FRONTIER LIFE under desert conditions greets the newcomer on the Boulder Dam project. Roulette wheels spin in Las Vegas gambling places, and far out on the desert the road and railroad grading crews, living in tent camps supplied with water by tank trucks, are rushing to provide ingress to the dam site. Other crews are erecting the first camp buildings for the permanent construction town of Boulder City. Work on the main dam contract is centered on preliminary road work in the canyon to blast an approach to the diversion tunnel portals. Hundreds of job seekers camped in the vicinity indicate that the labor supply will continue far in advance of the increase in labor demand. Scattered for miles back from the Colorado River are scenes typical of the start of a Western reclamation project, but on a magnitude never before approached. The visiting engineer today finds many individual features of interest and senses an atmosphere of forces being assembled and organized to attack the greatest dam-construction job ever attempted.

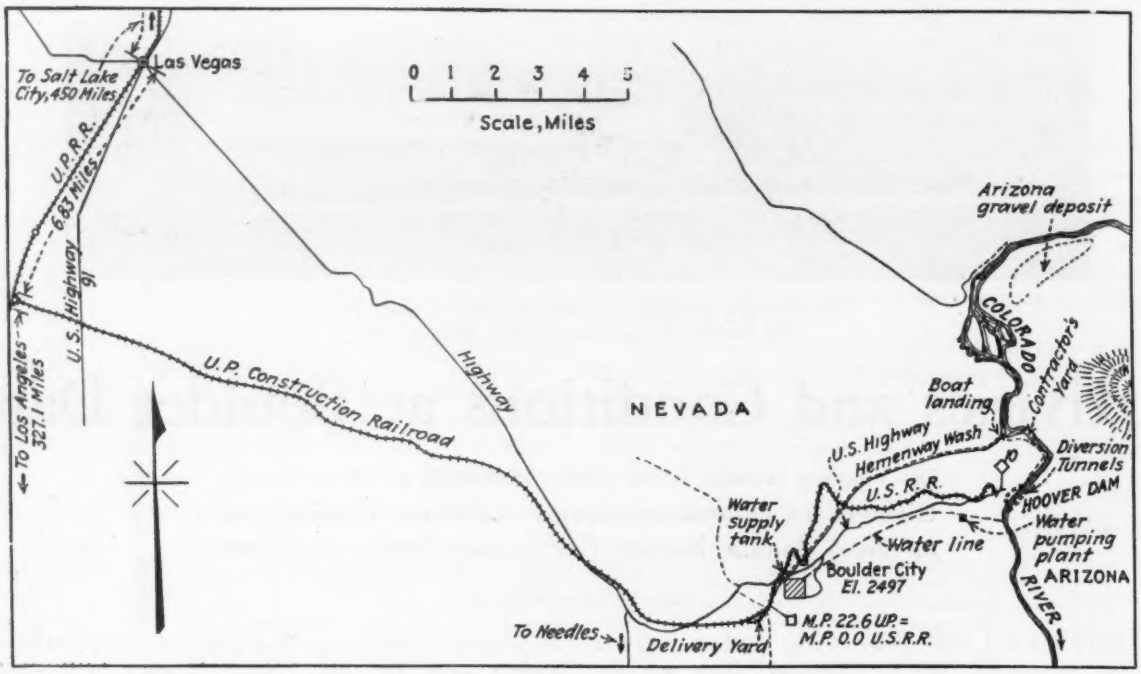
Las Vegas—Las Vegas, Nev., a typical railroad town of about 5,000—a division point on the Los Angeles & Salt Lake Railroad (Union Pacific)—is reveling in the boom it has awaited for years. Reveling is especially promoted by the new wide-open Nevada gambling law. Recently converted gaming halls, along the two-block main street, operate on a three-shift schedule. Crowds around green-covered tables and dealers peering from beneath eyeshades give a scene reminiscent of the old West in modern surroundings. Hotel accommodations are severely overtaxed, the park is filled with idlers, the street throngs with a motley crowd—in all, Las Vegas provides a proper introduction to the project for which it serves as a front door.

Around the town temporary habitations of every description house a part of the influx of men looking for work. Government and private warnings of the abundance of labor on hand have failed to stop the steady stream of newcomers. Many have driven hundreds of miles with families and household goods. Others, perhaps 300 or 400 persons, are camped in tents at the mouth of Heminway wash on the river about 2 miles above the dam site. This latter group live under severe conditions, including the carrying of their water in buckets from the river. Order is maintained among these squatters by a United States marshal. Danger of epidemic is always at hand, as well as the disastrous effect of a severe cloudburst sending a flood down the wash. Later, when facilities are available on higher ground, this settlement probably will move voluntarily, as summer temperatures in the canyon are beyond the endurance of women and children. Today lack of a water supply keeps these families from occupying land between Las Vegas and the river in the vicinity of the Boulder City site. Their occupancy of withdrawn government land is only by sufferance, and when town lots are ready they probably will be required to take up definite residence or remove from the territory.

Opening Up the Site—Under separate contracts the government is building a highway and a standard-gage railroad from Boulder City to the edge of the canyon at the dam site. These jobs are already well advanced. About 40 per cent of the 300,000 cu.yd. of grading on the 6-mile highway is completed. An oiled surface will be provided and the route eventually extended to form the permanent highway across the dam. Excavation for the 10 miles of railroad is about one-third completed, and two of the five short tunnels along the line have been holed through. The ruling grade on this line will be 3 per cent. Standard construction operations characterize both of these contracts.

Weeks before the actual signing of the $48,000,000 contract for building Hoover Dam, the Six Companies, Inc., San Francisco, successful bidders for the job, had started preliminary construction roadwork. The most immediate need was to provide an extension to the old existing road, which ends at the river about a mile upstream from the site, along the precipitous canyon walls to the portals of the diversion tunnel on the Nevada side. This work is under way and will provide access to the first "pay dirt" on the contract. At present, portable compressors and temporary equipment are being used.

In addition, the contractor is running a railroad location survey to establish a route from the government railroad into the canyon. The government line reaches the site near the top of the canyon walls above final flood



Boulder City is being built on a sagebrush desert 2,000 ft. above and 6 miles west of the dam site

line, but it is necessary for the contractor to provide the branch into the canyon where the first two or three years of work will be concentrated.

The extensive Arizona gravel deposits, considered a likely source of aggregate, lie about 6 to 8 miles upstream. The contractor is considering the possibility of building a railroad branch to the deposit, which would necessitate a bridge across the river. The alternative, also being considered, is an aerial tramline on a more direct route.

Boulder City—The site of Boulder City is a sage-brush desert, about 25 miles east of Las Vegas and 6 miles from the dam site. A treeless area, rimmed by bare drab hills, it lies under cloudless skies with the temperature rising steadily as summer approaches. By August the rock at mid-day will be too hot to touch. Such conditions are inevitable, however, and the government plans to improve them in so far as possible and provide proper town facilities for those who will make their homes in this desert community for the coming half-dozen years.

The town site was selected as the area closest to the dam with sufficient size to allow for anticipated development. The land slopes on a fairly uniform grade of about 3 per cent to the south. Streets have been staked out and work on sewers, water-distribution system and grading will be started soon. At the northern and higher side of the site the government will build administration buildings and living quarters for federal employees. Next, to the south, is space to be allotted to the business district, and beyond that lies the general residential area. The camp of the contractor probably will occupy an adjacent area to the west.

The all-important water supply for the town will be pumped about 6 miles from the Colorado River. At an intake located a short distance downstream from the dam site the water will receive a primary settling and then be pumped against a 2,000-ft. head through a 12-in. steel pipe line to the town. It will be delivered to a steel storage tank occupying the top of a knoll overlooking the site and will flow through a filtration plant into the distribution system.

The sewerage system will extend south of the town and terminate in a disposal plant with discharge into a dry lake bed. Possibility of reclaiming sewage for secondary water supply uses has not been overlooked but is not definitely planned at present. Lawn and garden sprinkling is certain to be extensive, and it is reasonable to foresee the possible economy of reclaiming part of the water supply for this use, when the 2,000-ft. original lift is considered.

The town site already is served by a railroad branch

Massed equipment building a highway to the dam

Shovels, tractors and "chariots" of Le Tourneau, Inc., on government road job.

built by the Union Pacific from the Los Angeles-Salt Lake City line, and a 400-car switching yard is ready for use. It is estimated that this branch line, during the height of the construction period, will have a heavier freight traffic than exists on any Western main line. The present 25 miles of state highway from Las Vegas to the town will be straightened and oil-surfaced.

The federal government will retain control over Boulder City area, which probably will be several miles in extent. One reason for this is to maintain an area around the town that can be kept free of undesirables and the effects of the new wide-open Nevada gambling law. Ordinary town facilities, including schools, hospital and fire protection, will be provided.

Details for the granting of government concessions for business enterprises in Boulder City have not been completed. However, it is understood that they will be in lease form. Estimates of population range from 3,000 to a maximum of 5,000 during the height of the construction period. The flood of more than 2,000 applications for permission to establish various types of businesses results directly from the unusual prominence of the project and ignorance of existing conditions on the part of many applicants. In reality, Boulder City is to be an exceptionally large and well-laid-out construction camp in a desert region. Living conditions will be hard, at best, and the permanence of the community after the construction period is a matter of conjecture.

Cutting a serpentine trail down the side of Black Canyon

Shovel of Six Companies, Inc., working its way down to the lower portals of the Nevada diversion tunnels. Site of dam is in middle background.

At present no government buildings have been put up, but the first buildings of the contractor's permanent camp, required by contract to be Boulder City, are being erected on skids at a temporary location near the town site. When the town plans are developed further and facilities are available they will be dragged into their final position. Bunk houses are being built with wood sheathing on the inside of 6-in. studding. The plan, apparently, is to put on a gunite or stucco outer wall to provide an insulating air space.

The electric-power supply for Boulder City and the construction work on the project, for the years prior to the development of power at the dam, will be supplied by a 225-mile transmission line from the system of the Southern Sierras Power Co., in southern California. This single-circuit 132-kv. line built across the desert from San Bernardino, is about completed. Construction work was carried out by the power company, using standard H-frame fabricated steel poles spaced about seven per mile. The line will terminate at a substation building of structural-steel construction near the dam site. From this point secondary transmission lines will be built to the town and various places of construction activity. The contractor will take service at the substation. Power will be ready for delivery at the substation sometime in June.

Climate—The climate of Boulder City and environs is typical of desert conditions. Temperature records from Las Vegas show a range from a minimum of 8 deg. to a maximum of 115 deg.; the daily average for January is between 40 and 50 deg. During July it is 90 deg. or higher. The annual mean is 62 deg., and average dates for killing frosts are Nov. 6 and Mar. 30. Summer humidity is strikingly low, about 30 per cent; in the river canyon the per cent probably is higher.

Average annual precipitation is about 4.8 in. Its occurrence is frequently in the form of severe cloudbursts, which may unbalance the annual distribution of rainfall for any one year, but the average over a period of eighteen years indicates the following monthly record, in inches.

January	0.85	July	0.61
February	0.58	August	0.49
March	0.37	September	0.35
April	0.30	October	0.27
May	0.20	November	0.27
June	0.16	December	0.34

The average annual fall of snow is 2 in. Elevation of Boulder City is about 2,500 ft., or 500 ft. higher than Las Vegas, and the climates should be very nearly the same. Conditions in the river canyon, particularly in summer, are much more severe. This was one reason for locating the town site on the higher and more exposed position. The effect of the canyon with its sun-heated rocks is to reduce air movement and its cooling effect. Consequently, summer-night temperature sometimes remains well over 100 deg. —*J.I.B.*

Thoughts on Stabilizing Construction

Two articles by active contractors discussing (1) reforms for reviving home building and (2) long-time planning of public works to stabilize employment

CONSTRUCTIVE THINKING on public-works planning and the revival of home building is shown in the two articles that follows. Both articles are by men well known in the construction field—both practical constructors and managers of great construction operations. They speak as constructors thoughtful in the economics of the great industry in which their livelihood has been gained, and not as scholars of economic theories. This gives their opinions a practicable significance that demands attention. Are these opinions sound? There will of course be dispute over the question, but they are the conclusions that two men have come to by themselves in reasoning from their own great experience in and knowledge of construction management. It is perhaps the greatest accomplishment of depression that it stirs up people to think. Contractors are in these days thinking creatively for the construction industry as they never before have done. The articles by R. L. Marshall, Jr., chief of war-time construction for the United States, afterwards general manager of the Associated General Contractors and now a general contractor, and by Frederick L. Cranford, veteran subway builder of New York City, are examples to the point. —EDITOR.

Stabilization of Employment

By R. C. MARSHALL
Vice-President B-W Construction Co., Chicago, Ill.

CONSTRUCTION has been singled out by government and business as the one industry most adaptable to playing a large part in relieving unemployment due to business depression. Public works is that part of construction to be utilized.

Direct Federal Action Limited

All who have given serious thought to the stabilization of industry and employment realize that no single part can stabilize the whole; it can only do its proportionate part. Construction amounts to about $8,000,000,000 a year, of which perhaps 30 per cent is public works. Normally states, counties and cities do nine or ten times more of this 30 per cent than does the federal government. Hence the problem of increasing or deferring public works is largely the problem of the states and minor political subdivisions. The federal government can, however, set up an agency which will assemble data and point out possibilities. This is what Congress undertook in passing the Wagner bills, which provide for the planning ahead and acceleration in times of depression of federal public works and also for a federal employment stabilization board to devise means of encouraging states to provide for similar advance planning.

Timed Construction a Remedy

There can be no doubt that holding construction up to normal by increasing public works sufficiently to take care of the drop in private work and the contraction or deferring of public works in prosperous times have not only a great stabilizing effect on industry as a whole but should and will have a very salutory effect on construction. Deferring public works in prosperous times tends to limit the number of construction companies and to limit the volume of labor for that purpose, so that the great expansion in numbers and advances in wages is to an extent limited. When business depression commences, if the construction industry is maintained at a normal volume through expanding public works to take the place of the contraction in private work, engineers and contractors are in a relatively good position, and construction would not find itself with that great surplus of personnel that it has in this depression.

Definite Administration Necessary

To put long-range planning into effect will require statistics to show continuously the state of industry and employment; it will require some functionary of the several political subdivisions to provide for the advance planning of public works, which includes deferring them; and it will require some functionary of the several political subdivisions to control the application of the contraction and expansion of public works.

Unless deliberate planning of public works is made and the plans and specifications are on the shelves ready for work to proceed, the remedy that this contemplates cannot be applied. The present depression amply proves this to be true. In spite of the enormous effort put forth by the federal government, with the assistance of state and other officials, the amount of public works in 1930 showed an increase of only 4 per cent.

Industry Should Assume Control

What if industry so ordered itself as to prevent unemployment, or at least measurably to take care of individuals in dull times? Many industries set up a reserve to take care of dividend payments in dull times. Why not set up a reserve to take care of the wages of the unemployed? If industry will not do this, why not have Congress or the several legislatures provide for a dole through the taxation of industry? God forbid that they ever do this—but why not? Some method of setting up a reserve in each industry in each locality to provide partial employment in times of depression is not without merit.

When compensation insurance was in its infancy many objected to it, and many objected to the states controlling or regulating it. Industry was slow. Consequently, legislation in many instances has gone far beyond the regulating stage.

In principle, 90 per cent of the people will agree that no federal employment agency should have power to regulate or dictate to state employment agencies. It violates the principles of states' rights and is paternalistic.

However, this very thing will surely come about unless industry can respond to the demand now being made that the unemployed be given his day in court. Old-age pension and dole for the unemployed are matters that are coming before Congress with all-too-recurring frequency. They are fostered by labor, by state labor departments and by many individuals. Their advocates are militantly organized. Unless and until industry can through publicity convince our legislators that these problems will be competently met, this class of legislation is clearly on its way to be written into our statute books.

* * *

Rehabilitating Home Building

By F. L. CRANFORD

Frederick L. Cranford, Inc., General Contractors, Brooklyn, N. Y.

DURING THE WAR—the period from 1914 through 1921—there was an interruption to construction, and particularly to housing construction. An educated guess as to the total amount of accumulated needed construction might be from eight to ten billions of dollars; consequently, during the period from 1922 to 1929, inclusive, there was great activity, and in the beginning there was a shortage of trained mechanics. As a result, building trade wages advanced entirely out of line with other industrial wages, and the cost of building construction advanced from a par of 100 in 1913 and remained steadily around 200 from that day to this.

It is conceded that construction is a very important factor of general prosperity. It therefore follows that this unusual activity in construction during these years was a large factor in the general prosperity of that period.

During the period of intensive speculation of 1927, '28 and '29, mortgage money was withdrawn from the market and housing construction diminished to the vanishing point. It was not a coincidence that general business activity diminished to the same extent that construction was a factor in producing general prosperity prior to 1929. To the same extent construction is effective in delaying general business activity at the present time.

Conditions That Retard Home Building

It is necessary again to start housing construction as an important factor in the rehabilitation of industry. I have given some thought to this subject for many years, and I believe it is now necessary to discuss frankly and criticize any factor or interest that retards or delays home building.

There are three important factors: finance, character of construction and labor costs. Particularly in large cities the cost of finance on second mortgage has been too high, and the cost of refinancing at the end of the usual three-year period would be unnecessary if this could be properly reorganized.

The character of building, particularly small housing, has been in many instances scandalous, and I believe that the speculator builder, who appears in boom times and upsets the standards in any community, is of questionable value to the industry and should be eliminated or controlled.

The present scale of wages of union labor (in all of our cities union labor is practically universally used on housing construction) ranges from $7.50 for common laborers to $13 and $14 for the higher skilled mechanic, with double time being paid for overtime.

If it is admitted that construction is an important factor in industrial activity and that it is reasonable and proper to build homes on a partial-payment plan, which requires financing, then it is self-evident that any excess cost for such financing or any undue burden imposed upon the purchaser for refinancing should if possible be eliminated. No subject can be more worthy of immediate attention.

It is a fact that in many sections the construction standard of the small homes has been disgraceful. Thousands and tens of thousands of our people have purchased homes at high costs, the character of the construction of which is below par. The President has stated many times that he believed the housing of our working population is one of our most important obligations. Nothing can be more important than that they should have a well-built home, which is also a safe investment.

Revision of Building-Trade Wages

The question of the revision of building-trade wages is important and delicate. In general the high standard of wages in America should not be lowered, as the standard of wages measures the difference in living standard between our people and those of other countries. This question requires consideration only if the present standard of wages is out of line with wages in other industries, prevents and delays activity in construction and is therefore a factor in postponing general prosperity.

To illustrate, using only one class of labor—that of the common laborer—the average wage throughout the United States today is probably under $3, and common labor can be secured at from 40 to 50c. per hour in any quantity right here in New York. The payment, therefore, of $7.50 for common labor and $8.25 for mason's labor (the hod-carrier of yesterday), with double time for overtime, is so out of line with other employment that I believe people are justified in not building at this time because of fear for the safety of their investment.

In considering this question of building-trade wages it is necessary to consider also the advisability of revising the prevalent so-called conditions of labor. Would it not be wise to draw a distinction between the skilled mechanic, necessary in the construction of our finer buildings, and the great mass of second-class mechanics, useful in ordinary construction work. Is there not a valid criticism of a standard of wages that makes no distinction between a skilled and an unskilled mechanic?

There are many jurisdictional disputes and also many rules enforced by labor unions that add costs with no return in value, all of which should at this time be openly and freely discussed, and all of the above I would urge be brought out in the open and discussed by the press. I am sure that the technical press must lead this discussion if it is to have any value, and that through its leadership real results can be accomplished that are of importance.

Looking a little farther ahead, there are undoubtedly millions of families in the United States who do not own their own homes, who have already saved sufficient money to make a substantial payment toward such an investment but only on the condition that they are assured reasonable and honest finance and well-built homes at a cost insuring a safe investment of their savings.

ENGINEERING LITERATURE

A Monthly Review of Books and a Listing of New Publications

German Steel Building Practice

REVIEWED BY DAVID CUSHMAN COYLE

Consulting Engineer, New York City

DER STAHLSKELETTBAU MIT BERÜCKSICHTIGUNG DER HOCH- UND TURMHÄUSER: Von konstruktiven Standpunkte behandelt für Ingenieure und Architekten—Von Dr. Alfred Hawranek, ord. Professor des Brücken- und Stahlhochbaues an der Deutschen Technischen Hochschule in Brünn—Berlin: Julius Springer. Cloth; 8x11 in.; pp. 286; 458 line cuts and halftones. 38 marks.

DR. HAWRANEK, who has been the engineer for some of the largest steel skeleton buildings in northern Europe, presents his confreres with a compendium of current practice. To an American the European structural practice is interesting more as a mental stimulus than as a guide. Conditions here are so different that there must also be a wide divergence in conception and method.

Perhaps the most striking feature of German practice is the use of continuity. Tail beams are regularly spliced across the girder. Many buildings are also made up of a series of single portals, one above another, each with a curved chord or kneebrace at the junction of post and girder, and with columns designed for bending. Where continuity is not desired, elaborate precautions are taken to prevent it. Thus, in a column of two I-sections battened, a common type, the girder is passed between the verticals and seated on an I-beam saddle carrying a rounded bearing plate so that the girder may rock without bending the column. On the Continent a small saving in tonnage will pay for a large increase in shop work, but it seems almost incredible that the heavy connections in some of the examples given could show any noticeable saving in weight.

This book contains examples of the German love for careful computation. Four pages, for instance, are devoted to the bending strength of two-angle clip connections having three and four rivets in the web of the beam. The error often made by Americans occurs also in Germany: Dr. Hawranek forgets to mention the thickness of the angles.

Connections have certain notable points of difference from ours. Turned bolts are used for field work more extensively than here. Wedges, involving field-drilled holes, occur not infrequently in continuous joints. Welding is apparently no more advanced than with us.

Battened columns, a form of construction not highly regarded in this country, are very common. It is not apparent whether the German engineers recognize the fact that the length of a battened part is the distance between alternate battens.

Where a beam frames concentrically into the flange of a column, the Continentals consider it to apply a vertical eccentric load at the flange face. In this country the practice has generally been to consider the stiffness of the connection as capable of transferring the load a few inches or outside the flange as may be necessary to balance the column.

Column splices are heavier and more elaborate than with us, less load is taken on milled ends and more on turned field bolts. The webs are always spliced, but a difference of 1/16 in. in web thickness makes it impossible to splice with two plates! Column bases are of the wing plate type.

Windbracing, mostly of the K type, is apparently frequent in buildings as low as seven stories, and the loads are from 20 lb. per sq.ft. for buildings 50 ft. high up to 30 lb. for the parts that are above the 80-ft. level.

Foundations are universally of concrete, except for an occasional beam grillage along a wall. No methods of computation are given. Retaining walls held by the floors are, however, computed by an elaborate theory. There is no indication of the use of cantilever footings.

Walls and floors are made of light materials. Pumice concrete and bubble concrete are in great favor. Terra cotta tile is used in many forms for fillers in long-span construction. One form, the Dedeco-Decke, is worth looking into, as it solves the problem of making the terra cotta carry compression. Precast slabs of lightweight concrete are used, with haunches cast in place around the beams. The bottom flange of the beam is often protected only by plaster. Aerocrete blocks with stucco or similar light materials are used for walls, as well as brick. The columns are brought as close as 5 in. to the face of the wall.

Among a number of evidences of the superiority of European culture is the fact that soundproofing is more considered in Europe than in this country. One building is shown where the stories are separated by providing column footings which rest on the story below, with a layer of insulating material preventing contact between steel surfaces. The apparent lack of interest in the use of field rivets is perhaps just another case of a civilized dislike of unnecessary noise.

Perhaps the most striking evidence of the profound difference in cultural background is in the planning of tall buildings. With us in most cases the planning is done by a realtor and a "builder," for whose offspring the architect and the engineer are merely the wet-nurse and the doctor. The result is the unplanned wilderness of ugliness which sprawls over so much of our urban area. In Europe the planning is primarily the work of the engineer and the architect. Realtors apparently are nonexistent. Buildings are planned with elaborate attention to their appropriateness to the neighborhood, the effect on the skyline, and the proper development of the city as a whole organism. The result is that the cities are not so generally ugly and disheartening as most of our city areas. On the other hand, some of the architects have contracted a sort of half-baked engineering that has led to very ugly buildings. Apparently the problem of how to build a satisfactory city will be solved only when it is undertaken by the concurrent efforts of architect, engineer and city planner.

Regarding the economic height of tall buildings, the author quotes several studies that show for German cities an optimum height of about twelve stories, contrasting with Clark and Kingston's figure of 63 stories for midtown New York.

The author takes comfort in the many difficulties which his countrymen avoid by not having to go in for skyscrapers. He is correct about the unpleasant features of large columns and footings, the problems of elevator service, and the difficulties of bracing. He might also

have added that the use of continuity, so dear to the continental heart, is not justifiable above the tenth floor. He gets out of his depth, however, about wind vibration, which he confuses with static deflection. He credits the Empire State Building with a harmonic half-amplitude of 24 in. which the present writer can state first hand to be an exaggeration. To his comment that such a sway must be disquieting to the occupants, one is tempted to reply in slang. It is refreshing, in view of the European tendency to allow the mathematics to obscure the inaccuracy of the original assumptions, to find the author, in his example of windbracing for a 21-story tower, admitting the fact that no exactness is possible, and distributing the loads without the help of higher mathematics

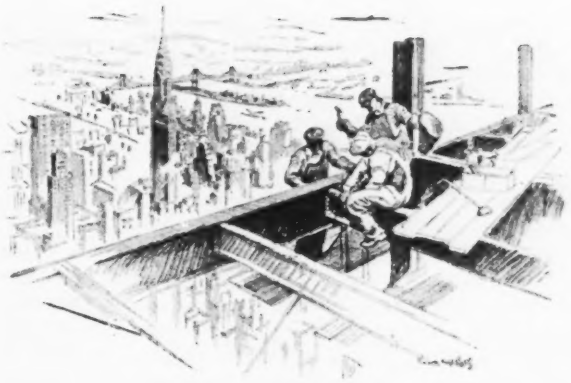
Altogether, this interesting exposition of the European attitude toward steel construction shows a practical grasp of the subject, comparatively little overrefinement, and in particular a sense of responsibility to the public welfare that we should do well to imitate in this country.

World's Tallest Building

EMPIRE STATE: A Pictorial Record of Its Construction. Drawings by Vernon Howe Bailey. [Text by Col. W. A. Starrett.] New York: William Edwin Rudge. Blue boards, white vellum back, with silhouette view of building embossed in white on front cover; 13x18 in.; pp. 32; frontispiece in colors and 25 full-page reproductions of pencil drawings. Boxed. Limited to 1,900 numbered copies. $15.

HOWEVER long or short the time may be during which the Empire State Building can proudly call itself the world's highest it will always be an outstanding example of architectural and engineering design and construction. Immense in bulk, exceeding in height the tallest structures previously built by man, architecturally

The finished building from a mile south
At left, Metropolitan Life; at right, New York Life.



Main roof level 85th story

adapted to the setback provisions of the New York zoning ordinance, and promptly put through by its promoters, designers, fabricators, constructors and thousands of workmen in New York and elsewhere, it deserves commemoration in as handsome a volume as the graphic arts can produce. This has been done in Vernon Howe Bailey's pencil drawings and their reproduction as a folio volume, preceded by a brief but sufficient account of the whole enterprise ably written by Col. Starrett. The drawings portray, as only the pencil of a master can, the various physical stages of the enterprise —demolition of the Waldorf-Astoria Hotel, excavation work, steel erection and wall construction. They also show the building in its relation to other notable structures, near and far. Inasmuch as the title page omits the names of the architects and builders it may be noted here that Shreve, Lamb & Harmon were the architects, Starrett Brothers & Eken the builders, and H. G. Balcom the designer of the steel frame. The volume is dedicated by the Starrett Corporation to the "able executives and loyal craftsmen" of the builders.

Well Presented

REVIEWED BY C. J. TILDEN
Professor of Engineering Mechanics, Sheffield Scientific School, Yale University, New Haven, Conn.

ELASTIC ENERGY THEORY—By J. A. Van den Broek, Ph.D., Professor of Engineering Mechanics, University of Michigan. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Cloth; 6x9 in.; pp. 260; many illustrations. $4.50.

THE solution, for the purpose of engineering design, of statically indeterminate structures may be reached by any one of various procedures. Prof. Van den Broek pleads the cause of the elastic energy theory. He not only believes in it but believes it to be the best of all possible approaches to problems of this sort. The theme is by no means original, but the presentation is well done, and the wide variety of application is indicated by a large number of special examples that make up the greater part of the book.

After a brief introduction—two chapters, but only seven pages—defining determinate and indeterminate structures and elastic energy (internal work), come chapters on the analysis of frames and redundant frames. Under the latter heading the airplane fuselage, "a highly redundant structure," is treated in detail. Temperature stresses and influence lines are mentioned briefly.

Chapters V and VI on beam analysis and redundant beams absorb 80 pages, about one-third of the book.

The second topic is divided into three parts—rectilinear beams (which includes a treatment of the theorem of three moments), bents (including the Vierendeel truss) and curved beams (rings, pipe filled with a liquid, the submarine and the dirigible). Combined bending and direct stresses, with biplane wings and the arch as examples, combined bending and torsion, the deformations in beams and shafts due to shear, and springs, both helical and spiral, are next considered.

The last chapter in the book, entitled "Estimate of the Elastic Energy Theory," is a seven-page essay, complete in itself, interesting and stimulating. As intimated above, the advantages of the elastic energy theory are advocated with almost a crusader's zeal. The author is fair, however, in listing also the limitations of the theory. His discussion of the nine fundamental assumptions which underlie the so-called "exact method" for analyzing wind stresses in skyscrapers is admirably written and full of inspiration for the structural engineer interested in the philosophic basis of design.

It is difficult to agree with Prof. Van den Broek's belief that the subject of this book could be advantageously included in a beginning course in strength of materials. Even if sophomores were intellectually fitted—as they are not—to absorb the theory and its applications, too many other topics would have to be omitted to make room for it. The book is an interesting addition to the literature of the subject in a limited but important field and should be of great value for graduate students and as a reference.

A Big Question

WHY RECOGNIZE RUSSIA? The Arguments For and Against the Recognition of the Soviet Government by the United States —By Louis Fischer [author of "The Soviets in World Affairs"]. New York: Jonathan Cape & Harrison Smith. Cloth; 5x8 in.; pp. 298; $2.

A QUESTION of deep and wide significance in world affairs is used for the title of Mr. Fischer's book, "Why Recognize Russia?" The question is of direct appeal to American engineers, contractors and other captains of industry, because to them the Soviet government has turned repeatedly for aid in solving the multiplicity of social, engineering, industrial and other problems with which it has been suddenly confronted. Although the author shows himself to be in favor of recognition, he presents much evidence and opinion pro and con from which openminded readers can draw their conclusions. This evidence concludes, on the last page of the book, with a list of 24 nations that have recognized Russia, including all the great nations except our own.

Give Engineers a Freer Hand

THE NEMESIS OF AMERICAN BUSINESS and Other Essays—By Stuart Chase. New York: The Macmillan Co. Cloth; 6x9 in.; pp. 191. $2.

STUART CHASE is one of the few current writers on the mechanization of industry who recognizes the benefits as well as the evils that have resulted from it and who does not attempt to load the evils, actual and imagined, upon the engineer. This does not come out very clearly in the title essay to his "The Nemesis of American Business," which seems pessimistic compared with his "Men and Machines" (noted in these columns Sept. 19, 1929, p. 469). It is made clear in the essay named "Prometheus Enchained," where engineers are represented as lacking a free hand to plan and direct their work for the benefit rather than the damage of mankind. An application of the idea is made in "Seven Salesmen and Six Hundred Engineers." All but two of the ten essays are reprinted from magazines, the three thus far mentioned from *Harpers, The Technology Review* and *Fortune*. Running through the volume are telling comments on overproduction, technological and other unemployment and their attendant problems, many of which are written from an engineering and all from a humanitarian viewpoint.

Space Framework

REVIEWED BY LEON S. MOISSEIFF
Consulting Engineer, New York City

SPACE FRAMEWORK: Theory, Problems and Exercises (Printed in Russian)—By Prof. Ing. I. S. Podolsky, Moscow, U.S.S.R.: Gosisdat. Paper; 7x10 in.; pp. 349; 332 line cuts in the text. Price 4 rubles ($2).

AN INTERESTING and timely book has again appeared from the pen of the industrious Prof. Podolsky of Moscow. It deals with the analysis of methods of computations of frames in space or three-dimensional frameworks. In a closely printed text, accompanied by hundreds of diagrams, the author presents a complete treatise on the subject. The first two-thirds of the work treats of the theory, and the last third contains problems and exercises in which the methods of computation are applied to numerous frameworks.

In clear and concise manner the author treats of the basic conditions of space framework, simple as well as complex. He discusses the conditions and supports and the statical determinedness of the systems. He then treats of the static equilibrium of forces in space. After this he proceeds to the computation of statically determined space framework. Such frames as form roof coverings, metal piers and towers, and hyperboloids have separate chapters. Finally, the computation of statically indeterminate trusses is treated, and a chapter is devoted to the skeletons of the airplane. The author handles his subject clearly and elementarily. The book should prove of value and assistance to the engineer who encounters those problems, and most engineers do. The book is well printed and the diagrams are clear.

Arbitration Procedure and Progress

CODE OF ARBITRATION: Practice and Procedure of the American Arbitration Tribunal—Editor, Frances Kellar, LL.B., First Vice-President of the American Arbitration Association, Collaborators, J. Noble Braden and other association staff members. Chicago, New York and Cleveland: Commerce Clearing House of the Corporation Trust Co. Flexible; 6x8 in.; pp. 284 + xxxvi-p. general and case indexes. $5 plus postage.

THE American Arbitration Association was organized because of the need for establishing uniform rules and practices in arbitration, and to assist parties desiring to settle disputes by arbitration rather than by resort to the courts. The association is composed of members, associates and organizations affiliated to advance arbitration in the United States, and it maintains for this purpose the American Arbitration Tribunal. In its book, the "Code of Arbitration," the association sets up a standard of practice and procedure in arbitration. Every step in the procedure of arbitration, from the making of the submission to the making of the

award, is fully covered. These steps include the initial procedure, the selection of arbitrators, the arrangements for hearings and proceedings during hearings and the regulation of costs of the arbitration. Standard arbitration clauses are recommended. Texts of the United States arbitration act and the New York arbitration act are given. A digest of decisions affecting the practice of arbitration and a summary of standard forms are presented in the appendix.

More Than a Good Textbook

PRINCIPLES OF CITY PLANNING—By Karl B. Lohmann, M.Am.Soc. Landscape Arch., M.Am.Cy. Planning Inst., Professor of Landscape Architecture, University of Illinois. New York and London: McGraw-Hill Book Co., Inc. Cloth; 6x9 in.; pp. 395; many illustrations. $4.

IN HIS "Principles of City Planning" Prof. Lohmann has produced a book well suited for school and college use, for city officials concerned with planning, for engineers not yet specialists in the subject and for the wide-awake citizen. Even the specialist may find the book useful as the latest available review of city and regional planning. After introductory chapters the author summarizes the history of city planning by periods, including the comparatively recent attention given to it in America. He then takes up the city plan, streets, traffic control, transportation facilities, ports—both water and air—parks and a variety of other pertinent topics, including law, finance and publicity. The numerous illustrations are well chosen. The book deserves wide use.

Engineer and Philosopher

THE AUTOBIOGRAPHY OF AN ENGINEER—By William Le Roy Emmet. Albany, N. Y.: Fort Orange Press. Cloth; 6x9 in.; pp. 213; halftones. $2.

WILLIAM LE ROY EMMET'S "Autobiography of an Engineer" is as notable for its philosophical reflections as for its account of his achievements in engineering. He intersperses his interesting narrative with opinions on what contributed to his success in overcoming various difficulties in early street railway and electric light and power installations and in his later and better known part in the perfection and practical application of the steam turbine, ashore and afloat, and in his pioneer work on mercury vapor as a substitute for steam power. The volume contains many interesting facts incident to his 30 years with the General Electric Co., his associates there, and his service on the Naval Consulting Board. There are sage reflections also on socialism and democracy. Mr. Emmet's recreations, from boyhood days on, are not overlooked. The autobiography shows a wide range of activities during a long and successful career. It can be commended heartily for its technical and general interest and for the stimulus it should give to engineers old and young.

Removal of Surplus Water

LAND DRAINAGE AND FLOOD PROTECTION—By Bernard A. Etcheverry, M.Am.Soc.CE.; Consulting Engineer; Professor of Irrigation and Drainage, University of California. New York and London: McGraw-Hill Book Co., Inc. Cloth; 6x9 in.; pp. 327; illustrations and tables. $3.

UNIQUE in the fact that it combines the two elements of hydraulic engineering named in its title, Prof. Etcheverry's "Land Drainage and Flood Protection" tells how to get excess water away from the land, both from above and from below the surface.

The first eight chapters treat land drainage in an up-to-date way, describing soils, harmful effects, volumes, drainage by large open channels, underdrainage and drain-tile materials. Drainage of waterlogged, irrigated lands has now become essential in many irrigated areas.

A chapter states the factors encountered. The flood-control chapter is a highly compressed coverage in 56 pp. of the Sacramento and Mississippi flood-control plans from levee designs, construction and protection to interior drainage and pump types. River flow hydraulics, reclamation of tidal lands and assessment procedure are three unrelated subjects covered in as many chapters. The organization of districts and methods of financing must follow local state laws, but the author has analyzed these carefully and given the common law and other rules for benefit ascertainment and examples of various methods of assessment for drainage districts and projects generally in vogue in the western part of the country.

All in all the book should be a welcome addition to the library of the drainage engineer, who must be versed not only in that enticing though elusive science of drainage hydraulics but also in the practical, financial and legal procedures of conceiving and putting through a drainage project.

Getting Results From Diesel Engines

MODERN DIESEL ENGINE PRACTICE: A Comprehensive Treatise for the Student and Practical Engineer—By Orville Adams, Consulting Diesel Engineer. New York: The Norman W. Henley Publishing Co. Cloth; 6x10 in.; pp. 656; many illustrations. $6.

WITH the steady growth in the use of diesel engines as power sources in many fields a need has arisen for a practical manual dealing with the selection, installation, operation and maintenance of these units; a book that will guide in the selection of an engine for a particular purpose and show how to keep it operating at maximum efficiency. Mr. Adams' book is intended to meet this demand, and also to serve as a text for study and reference. It is written in non-technical language for the operator and buyer, rather than for the designer; its primary purpose is to make clear proper fields of application, operating principles and details of construction of contemporary engines of the diesel type. This the author accomplishes creditably; there is little doubt that his book will satisfy a large class of operators, mechanics and students interested in this type of prime mover.

How to Reach the Public

PUBLIC REPORTING: With Special Reference to Annual, Departmental and Current Reports of Municipalities—By the National Committee on Municipal Reporting; Chairman, C. O. Sherrill; Executive Secretary, Wylie Kilpatrick. New York: Municipal Administration Service, 261 Broadway. Paper; 7x10 in.; illustrated. 75c.

THE deadly dullness of most city and other government reports is well known. That something can be done to make these reports readable accounts of the stewardship of public officials, in terms both of service and of cost, is made plain in "Public Reporting," a study by a committee representing several municipal associations. The committee was aided by an advisory council of 24 members, chosen as specialists in various municipal fields, including public works, utilities and city planning. The main concern of the monograph is to show the general failure of municipal reports to interest and inform citizens and taxpayers and to show how this failure may

be remedied. Reporting principles and methods are outlined, with examples of their application to the various city departments. A plea is made for the creation of public reporting departments in the smaller cities or the assignment of this responsibility to some competent administrative officer, in charge of both stated periodical reports and continuous publicity through the local press and otherwise. The monograph deserves wide and careful attention.

Publications Received

MOTOR VEHICLE taxation and regulation in the United States is reviewed concisely in two pamphlets just published by the Motor Vehicle Conference Committee, 366 Madison Ave., New York City.

PROGRESS REPORTS on the Hudson River and Kill van Kull bridges, under construction by the Port of New York Authority (80 Eighth Ave., New York City), bring the story of these enterprises up to March of this year. Each report is well illustrated and contains tabular and other data.

ESTHETICS OF BRIDGES is the subject of a special number of *Le Moniteur des Travaux Publics*, 23 Rue de Chaleaudun, Paris, France. The paper is subdivided into sections devoted to bridges of wood, stone, metal and concrete. It is profusely illustrated with halftone reproductions of photographs and some line cuts. Most of the bridges described are in Europe, but many of the important bridges in this country also are shown. (30 francs.)

A REVISION of the well-known and much-appreciated booklet of the sewage-works of Birmingham, England, and vicinity has just been brought out by H. C. Whitehead, engineer to the Birmingham, Farne and Rea Drainage Board, Rookery Park, Birmingham, England. The district has an area of 107 square miles and an estimated population of 1,200,000. The sewage is treated at three plants. Sedimentation is supplemented by the activated-sludge process (locally known as "bio-flocculation") before the effluent goes to percolating filters. Separate sludge digestion, with utilization of the tank gases for power, is a feature of the works.

BUILDING SPECIFICATIONS prepared by the American Specifications Institute, Chicago, and published by the Specification Record, Inc., 160 North La Salle St., Chicago ($10) begin with concrete pile foundations and cover a variety of mason work, roofing, flooring, door and window fittings, ventilation, glazing, interior finish and electric equipment for lighting and refrigeration. Interspersed with these are manufacturers' specifications and descriptions relating to various proprietary materials and appliances. Brief notes as to the preparation of specifications are also included, together with general conditions for building and engineering contracts, a page on arbitration and a list of specifications of the American Society for Testing Materials.

UNDER THE TITLE "The Evolution of Meteorological Institutions in the United States" a concise summary of the subject indicated is given in the *Monthly Weather Review* for January, 1931, the article having been prepared by Eric R. Miller, of the U. S. Weather Bureau at Madison, Wis. The record summarized extends from 1763, when Benjamin Franklin, as postmaster general of the Colonies, "used his contacts with postmasters and shipmasters for research on progression of cyclones and ocean currents," to the formation of the American Meteorological Society in 1919. The record is arranged chronologically. The literature cited runs to 73 entries. Fifteen cents from Superintendent of Documents, Washington, D. C.

New Books and Revised Editions

[Those desiring copies of the books listed below or mentioned elsewhere in this section should order them from the publishers or from their local booksellers.]

AMERICAN STANDARDS YEAR BOOK, 1931—New York: American Standards Association, 29 West 39th St. Paper; 8x11in.; pp. 102.

Reviews progress in standardization, which included 46 new industrial standards in 1930.

THE ANEROID BAROMETER AND ALTIMETER: Their Characteristics and Use in Mapping—By R. H. Field, Supervisor, Physical Testing Laboratory, With an Appendix on the Field Use of the Aneroid Barometer, by G. C. Cowper, Dominion Land Surveyor. Ottawa: Topographical Survey of Canada. Paper; 6x10 in.; pp. 36; illustrated. 10c.

BUSINESS ADRIFT—By Wallace Brett Donham, Dean, Harvard Graduate School of Business Administration, With an Introduction by Alfred North Whitehead, Professor of Philosophy, Harvard University. New York: Whittlesey House, McGraw-Hill Book Co. Cloth; 6x9 in.; pp. 165. $2.50.

EMPIRE MUNICIPAL DIRECTORY AND YEAR BOOK, 1931-1932—49th year. London: Sanitary Publishing Co., 8 Breams Building, E.C. 4. Cloth; 7x9 in.; pp. 356 (including advertising); tables. 12s. in England.

Besides the directory of municipal officials for Great Britain, Ireland, Canada and other countries in the British Empire, has reviews of 1930 progress in roads, motor transport, reinforced concrete, cement, lighting, water supply, sewerage, refuse collection and disposal and other topics.

ENGINEERING GEOLOGY—By H. Ries, Ph.D., Professor of Geology in Cornell University, and Thomas L. Watson, Ph.D., State Professor of Geology in the University of Virginia. Fourth Edition. New York: John Wiley & Sons. London: Chapman & Hall. Cloth; 6x9 in.; pp. 708; line cuts and halftones. $5.

A 20-p. chapter on the geology of reservoirs has been inserted in this edition and the references brought to date. The three earlier editions were favorably noted in *Engineering News*, Sept. 17, 1914, Jan. 20, 1916, and *Engineering News-Record*, March 19, 1925.

IL LABORATORIO dell' Instituto Sperimentale Stradale, 1919-1930—Milan, Italy: Touring Club Italiano. Paper; 6x10 in.; pp. 159, halftones and line cuts.

Reviews a dozen years' work of the Italian experimental road laboratory named and describes apparatus.

LABORATORY TESTS OF REINFORCED-CONCRETE ARCHES WITH DECKS—By Wilbur M. Wilson, Research Professor of Structural Engineering. Urbana, Ill.: Engineering Experiment Station. Paper; 6x9 in.; pp. 97; halftones and line cuts. 50c.

LUMBER AND ITS USES: A Practical Treatise Describing in Non-Technical Language the Properties and Uses of the Principal Commercial Species of Wood Which Are Manufactured Into Lumber—By Royal S. Kellogg, Author of "The Timber Supply of the United States," etc. Fourth Edition. Revised, Enlarged and Entirely Reset. New York: Scientific Book Corporation, 15 East 26th St. Flexible fabrikoid; 6x9 in.; pp. 378; halftones and line cuts. $4.

Aside from extensive revision and the insertion of new material here and there, this edition contains "recently adopted specifications for American Lumber Standards." One of the features of the book is a brief description of each leading species of wood followed by a list of its commercial uses, the latter sometimes extending to scores of entries.

MITTEILUNGEN DES HYDRAULISCHEN INSTITUTS der Technischen Hochschule München—D. Thoma, Dr. o. Professor. München and Berlin: R. Oldenbourg. Paper; 8x11 in.; pp. 104; many illustrations. 20 marks.

MODERN ARCHITECTURE: Kahn Lectures for 1930—By Frank Lloyd Wright. [Princeton Monographs in Art and Archæology.] Princeton, N. J.: Princeton University Press. London, England: Humphrey Milford, Oxford University Press. Picture boards; 8x11 in.; pp. 115; halftones. $4.

NATIONAL PHYSICAL LABORATORY—Report for year 1930, made for British department of scientific and industrial research. Paper; 8x11 in.; pp. 295; illustrated. 12½s. from any H. M. Stationery Office; $5.20 from British Library of Information, 551 Fifth Ave., New York City.

A general review is followed by reports on physics, electricity, meteorology, engineering, aerodynamics, metallurgy and ship tank study.

NATURAL TRIGONOMETRIC FUNCTIONS: to Seven Decimal Places for Every Ten Seconds of Arc, Together With Miscellaneous Tables—By Howard Chapin Ives, C.E. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Cloth; 7x10 in.; pp. 329; many tables. $9.

Seven-place sines, cosines, tangents and cotangents at ten-second intervals, with proportional parts to seconds, occupy the first 270 pp. of this book. The remaining 59 pp. contain miscellaneous mathematical data, mainly in tabular form, selected especially because of their application to subdivision work, including 4 pp. of survey definitions and theory and directions for the efficient use of the tables contained in the book.

PATENT LAW FOR CHEMISTS, ENGINEERS AND EXECUTIVES—By Fred H. Rhodes, Professor of Industrial Chemistry, Cornell University. New York and London: McGraw-Hill Book Co. Cloth; 6x8 in.; pp. 207. $2.50.

PORTS OF MIAMI AND TAMPA, FLA. (Revised, 1930)—Prepared by the Board of Engineers for Rivers and Harbors in Cooperation with U. S. Shipping Board. Paper; 6x9 in.; pp. 111; folding maps; tables. 40c. from Superintendent of Documents, Washington, D. C.

THE PSYCHOLOGY OF THE INVENTOR: A Study of the Patentee—By Joseph Rossman, Ph.D., M.P.L., B.S. in Chem. Eng., LL.B., Patent Examiner, U. S. Patent Office, Member of the Bar of the U. S. Court of Customs and Patent Appeals and the U. S. Supreme Court. Washington, D. C.: The Inventors Publishing Co. Cloth; 6x9 in.; pp. 252; tables. $3.

SIDEWALKS AND CITY STREETS: Granting Privileges as Sources of Municipal Revenue—By Lucius H. Cannon, Librarian. St. Louis, Mo.: Municipal Reference Library. Paper, cloth back; 9x12 in.; 33 pp. mimeographed. $1.

Data from Chicago and a few other cities, including court decisions.

THE STORY OF THE CITY MANAGER PLAN—New York: National Municipal League, 261 Broadway. Paper; 4x6 in.; pp. 48; diagrams. 10c.

A popular exposition of the council-manager type of government. Contains a list of manager cities, with populations and dates in effect.

NEWS OF THE WEEK

First Conviction in Oregon for Violation of Registration Law

The first criminal conviction in Oregon for violation of the engineers' registration law was secured in Multnomah County on May 14, when Andra MacLean, of Portland, Ore., withdrew a plea of not guilty and entered a plea of guilty of practicing engineering without a license. A $25 fine was imposed.

Contract for Hetch Hetchy 47½-Mile Pipe Line Awarded

The contract for the construction of the pipe line to convey the Hetch Hetchy water supply across the San Joaquin Valley and the Red Mountain Bar siphon, a connection between two sections of the Foothill tunnels, was awarded to the Youdall Construction Co., of San Francisco, May 22, on a bid of $4,136,479. Twelve months is the time allowed for its construction.

Construction of this pipe line will bring the Hetch Hetchy water supply from the western end of the completed Foothill tunnels to the eastern portal of the Coast Range tunnel, now being driven. In the event that a water shortage threatens San Francisco before the tunnel construction is completed it will be possible to pump the water from the end of this pipe line over the Coast Range through a temporary pipe line. This emergency provision would afford a means of bringing Hetch Hetchy water to San Francisco two years ahead of completion of the entire project.

Varying Trends in Prices of Cement in Many Sections

FACTS concerning the general reduction in the price of cement throughout the country were presented on p. 826 of the May 14 issue. Year-ago and more recent prices were given at 42 cities. The drop averaged 16 per cent from the level of March 1, 1930, and 9 per cent from the level of March 1, 1931. Further data follow:

At mills in Dewey and Ada, Okla., the price was $1 on May 11. The mill price quoted for state highway cement on Feb. 3 was $1.40, and at the March 20 opening about $1.15. The $1 price holds also at Kansas mills.

Jefferson City, Mo., reports that reductions in that state have not been reflected in local dealers' prices. At Springfield, Ill., the price is $1.75, compared with $2.05 on March 1, with indications of a 30c. rise within 60 days. The price in Knoxville is actually higher than it was a year ago, but 20c. lower than on March 1 last, the result of small activity in the local market. In Louisville there has been a gradual price reduction without war. At Columbus the March, 1930, the price of $3 in paper held until August, then went to $2.70. The next drop was 50c., shortly before March 1 this year. Further reductions in March brought the price to $2 and in some cases to $1.90. In Cincinnati $1.72 has held for two months with the likelihood of continued firmness. The

(*Continued on page 907*)

Business Chances Limited in Boulder City, Bureau Warns

Business opportunities in Boulder City, Nev., will be limited and fully controlled by government permits, the U. S. Bureau of Reclamation states as a warning to those tempted to rush to the temporary city, near Hoover Dam, with the expectation of getting a government concession. Application for a permit must be made on forms provided by the bureau, accompanied by a filing fee of $10, and must be filed with Louis C. Cramton at the office of the Bureau of Reclamation, Las Vegas, Nev., by June 30, 1931.

Present plans are to issue permits to at least two competing interests for every necessary type of business. After the town is well established and the need for additional business arises, more permits will be issued. Land for business or residence purposes will be leased by the government until June 30, 1941. No land will be sold and no buildings will be erected by the government except for its own employees. The permits will stipulate the type of construction to be followed.

The following is given as additional warning to interested persons: That the probable population of Boulder City is more limited than is popularly imagined; that as the surrounding country is undeveloped there is no outside population from which patronage may be expected; that the contractor will, through its commissary and other facilities, furnish goods and services to companies with permits; that the amount of business to be derived from tourists

UNION PACIFIC'S TERMINAL WAREHOUSE AT LOS ANGELES

Construction of a reinforced-concrete six-story and basement terminal warehouse for the Union Pacific system is under way at Ninth and Alameda Sts., Los Angeles, Calif., and will be completed by midsummer. The cost of the structure, which is being built by the J. V. McNeil Co., will be $1,000,000. The building will cover a site 100x620 ft., providing floor space totaling 434,000 sq.ft., and will be a part of the Union Pacific freight terminal. The California railroad commission has authorized operation of part of the building as a public commercial warehouse. Ground floor frontage on Alameda St. will be utilized for stores and offices incidental to warehousing and storage. Space on the upper floors will be allotted for offices of jobbers, brokers and manufacturers' agents. Railroad trackage to be installed will permit the loading or unloading of 26 freight cars at one time. The illustration shown here is the architect's sketch.

and other visitors to the town is uncertain; that the future of the town after 1938 likewise is uncertain; and that climatic conditions may not be suitable for everyone. A word of caution is expressed to applicants to beware of all persons pretending to possess special influence in securing permits or leases and seeking to obtain money for such pretended influence.

Hoover Dam Notes

Gravel surfacing is now being placed on the government road connecting Boulder City with the dam by the General Construction Co., of Las Vegas, on a subcontract with the General Construction Co., of Seattle. Le Torneau, Inc., is doing the grading work on the highway. Although the contract completion date for the highway is July 1, it is expected that the road will be completed at least two weeks earlier.

Construction has started on twelve first-class residences in Boulder City to house Reclamation Bureau officials and employees. The structures will have stucco exteriors and must be completed by Aug. 9.

The Nevada state highway department is constructing a new road between Las Vegas and Boulder City.

The 2,000,000-gal. steel water tank for the water supply of Boulder City has been completed. Water will be pumped from the Colorado River, from a point below the dam site, 6 miles from Boulder City, against a 2,000-ft. head. Contract for the pumps, settling basin and appurtenant work has been awarded and construction of the 6-mile pipe line is under way.

Six Companies, Inc., contractor for the construction of the dam, is building a road to the lower portals of the Nevada diversion tunnel. Another road is being constructed from the mouth of Heminway wash, about a mile above the dam site on the Nevada side, to the upper portals of the Nevada diversion tunnels. This road will later be used as a railroad grade.

Muck from the four 50-ft. diversion tunnels will be disposed of over four railroad lines to be built by Six Companies, Inc. From the upper portals of the diversion tunnels on both sides of the river a railroad will be built to the upper cofferdam. From the lower portals of the Nevada diversion tunnel a railroad will be built for about half a mile downstream along the Black Canyon Gorge and then will go through a tunnel to reach a small side canyon offering disposal space for the muck. On the Arizona side a railroad will be built for a distance of a mile downstream from the lower portal of the diversion tunnel and will then turn into a side canyon, where muck can be dumped.

The contractor has started driving two adits from the canyon walls to each of the outer diversion tunnels, about their midpoint. The top heading method will be used in driving the four diversion tunnels and the two adits will provide additional faces from which the outer tunnels can be worked.

A minimum wage rate of $4 per day will be paid by Six Companies, Inc., for common labor, according to W. A. Bechtel, vice-president. Previously the scale at the dam was $3.50 per day. Six Companies now has 530 men on its payroll.

Two rock drillers employed by Six Companies were killed on May 17 by a rock slide on the Arizona side of the canyon. The men, drilling on a road being built from the top of the gorge to the lower end of the Arizona diversion tunnels, were caught under a fall of 20,000 cu.yd. of rock breaking loose from the canyon wall near its top. Another fatality occurred the next day when a powderman working for Lewis Construction Co. was killed by the premature explosion of a charge he was tamping.

Trade Commission to Look Into Government Building Contracts

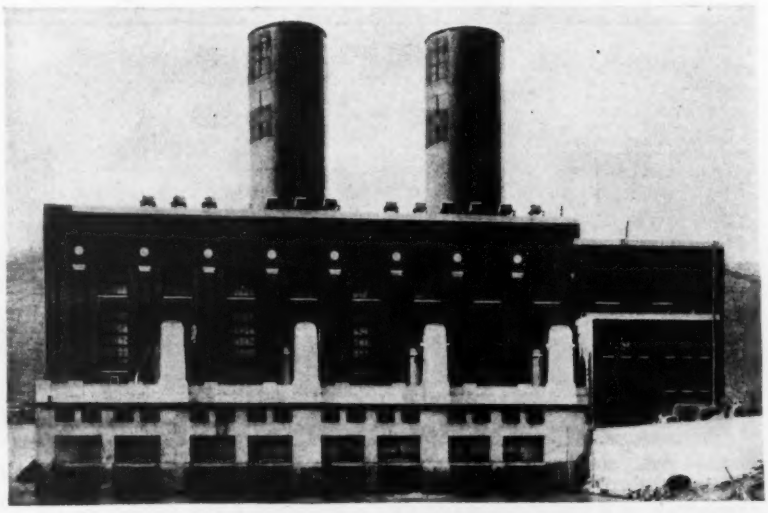
The Federal Trade Commission has recently undertaken an investigation of the building material industry and preliminary work is now under way. In this inquiry the commission will investigate and report facts relating to the letting of contracts for the construction of government buildings, particularly with a view of determining whether or not there have been any price-fixing or other agreements among individuals, partnerships or corporations engaged in the production, manufacture or sale of building materials with respect to the prices or other terms at which such materials will be furnished contractors or bidders for such work.

New York's Most Expensive Subway to Open May 30

The new Nassau-Broad St. subway link will be opened by the New York board of transportation on May 30. The subway has been under construction for three years, and although but 4,822 ft. long, cost $10,072,000, or $2,068 per foot. It connects the existing B.-M.T. Center St. loop with the B.-M.T. Montague St. tunnel under the East River, and provides another subway route to Brooklyn. The line is not part of the city's independent system now under construction, but was built for the B.-M.T. company under the dual contracts dated March 19, 1913. Nassau St. is but 34 ft. wide between building lines. Many of the city's early tall buildings lining the narrow street had to be underpinned, adding to the cost of the work. The difficulties of constructing this line were described in *Engineering News-Record*, June 27, 1929, p. 1018. The extension of the Fourteenth St. line of the B.-M.T. from Sixth to Eighth Ave. will also be opened on May 30

Union Station for Sioux City

Two projects for a union station at Sioux City, Iowa, have been prepared by A. J. Hammond, consulting engineer, Chicago, and submitted to the city council, which is considering terminal improvements. This station would replace the present three stations used by five railroads. By developing the Chicago & Northwestern station for use of all the roads, the cost would be about $200,000, whereas an entirely new station would cost about $1,100,000.



POWER HOUSE AND STEEL SURGE TANKS SALUDA HYDRO-ELECTRIC PROJECT

Two of the ultimate six 32,500-kw. units at Saluda Dam, near Columbia, S. C., are now generating power for the Lexington Water Power Co. W. S. Barstow & Co. built the project. The Arundel Corporation was subcontractor on the dam, which required 11,000,000 cu.yd. of earthfill.

Cement Prices Vary

(*Continued from page 905*)

large supply in Cleveland has resulted in several decreases; the last, on May 8, from $1.55 to $1.40.

Price f.o.b. cars Sacramento has been $2.35 for more than a year. San Francisco dealers state that prices have not been cut this year, but that a manufacturer is underselling by eliminating hauling costs. There continue to be indications of consolidations by some of the important companies in the Pacific Northwest. From the present outlook these are likely to start in the State of Washington. The cement industry in California is operating at about 30 per cent capacity.

Comparative prices are given below for eleven cities, bringing the total reporting in the period to 53 in the United States and one in Canada.

	1930, Mar. 1	1931, Mar. 1	1931, April 1	1931, May 1	Per Cent Drop from March 1 1930	Per Cent Drop from March 1 1931
Louisville	$2.02	$1.84	$1.41	$1.41	30	23
Knoxville	1.79	2.10	1.91	1.91	+7	9
Memphis	2.29	2.08	1.86	1.86	15	10
Cincinnati	2.29	2.26	1.72	1.72	25	24
Cleveland	2.30	2.00	2.00	1.55	33	22
Columbus	3.00	2.20	2.00	2.00	33	9
Springfield, Ill.	2.25	2.05	1.75	1.75	22	15
Jefferson City	2.80	2.40	2.40	2.40	14	..
Denver	2.55	1.80	1.80	1.80	29	..
Helena	3.43	3.43	3.43	3.28	4	..
Phoenix	2.62	2.88	2.88	2.88+14		..
Sacramento, f.o.b.	2.35	2.35	2.35	2.35	..	..
San Francisco	2.41	2.34	2.34	2.34	3	..
Av. 13 cities	$2.32	$2.29	$2.16	$2.10	9	8
Av. 54 cities	2.32	2.26	2.12	2.05	12	9

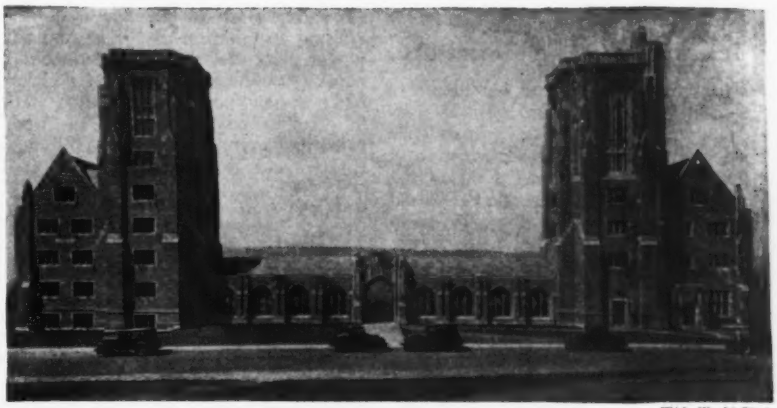
Plans Approved for Last Unit of Golden Gate Bridge

Plans and specifications for the last unit of the Golden Gate Bridge, consisting of the approach spans, under and over passes, toll houses and other structures, and electrical equipment and painting, have been approved by directors of the Golden Gate Bridge and Highway District. Bids for all units of the $35,000,000 suspension bridge across the Golden Gate at San Francisco will be received June 17, 1931.

The offer of the Byllesby-Loveland Engineering Co. (*ENR*, May 14, 1931, p. 824) to take over the entire $35,000,000 bond issue and turn over the completed bridge to the district was rejected by unanimous vote of the directors of the bridge district May 20.

Free Highway Bridge Proposed Over the Rio Grande

The state highway commission of Texas has opened negotiations with Mexico for the construction of a free bridge over the Rio Grande, the expense to be borne jointly by the state and Mexico. If built, the bridge will be located a few miles south of McAllen, Tex., and will be the connecting link between the highway that reaches the river on the American side and the Reynosa-Monterey highway now being built in Mexico. At present all the eleven structures over the Rio Grande open to vehicle and foot traffic are toll bridges.



Wide World Photo

MEMORIAL TO CORNELL'S WAR DEAD

Front view of Cornell University's new war memorial, which stands as a tribute to the 264 Cornell men killed in the World War. The building was dedicated on May 23. President Hoover, in a radio address, eulogized Cornell's heroes.

Morse Chosen to Head Seattle's Department of Light

W. Chester Morse, consulting engineer, who served as city engineer of Seattle, Wash., during 1927 and 1928, has been named to succeed J. D. Ross as superintendent of Seattle's lighting department. The appointment was made by Mayor Edwards and was the second in a succession of five appointees named by the mayor and tentatively rejected by the city council during a protracted struggle to bring about the reinstatement of Mr. Ross. Mr. Morse was confirmed by a 5 to 4 vote ot the council.

Mr. Morse has been a resident of Seattle since 1882. In 1908 he started in private engineering practice in Seattle, and since that time he has planned and supervised the construction of numerous water systems. For two years he was chief engineer of the Puget Sound Bridge & Dredging Co. in charge of hydraulic projects. A member of the American Society of Civil Engineers, Mr. Morse has been engaged in private practice since his retirement as city engineer of Seattle.

Mr. Morse opposed the charter amendment, carried at the spring election, giving the city light department its own engineering staff, stating that Seattle has not grown large enough to make the move necessary.

C.&O. R.R. Lets Contract for New Double-Track Tunnel

A contract has been awarded by the Chesapeake & Ohio Railway Co. to the Boxley Brothers Co., Inc., of Orange, Va., for the construction of a new double-track tunnel and bridge over Greenbrier River, also for a new single-track tunnel parallel to the present Mann's tunnel, at an estimated cost of $1,564,500.

The line revision will extend from Rockland Station westwardly about 1.5 miles to a point about 1.5 miles east of Fort Springs, W. Va. The new bridge will be of the ballast deck steel girder type, consisting of five 100-ft. spans. The construction of this line revision, including the new tunnel and bridge, will provide a continuous double-track line with standard clearance. The existing line, which has limiting clearance and is single track over the present bridge and through the present tunnel, will be abandoned. A saving of 1,000 ft. in distance and 100 deg. of curvature will be effected.

The new single track Mann's tunnel will be 1,060 ft. long. It will be located on the north side of the present tunnel just west of Fort Springs, W. Va.

Engineering Alumni to Hold Joint Economic Conference

Alumni of Stevens Institute of Technology and of the engineering schools of Columbia University will hold an economic conference at the Stevens Engineering Camp in Warren County, N. J., near the Delaware Water Gap, Aug. 30 to Sept. 7. This conference is in line with the movement of colleges to offer to alumni opportunity to continue their professional educations through the colleges after graduation. The conference has received a grant of $1,500 from the Carnegie Corporation.

Several hours each day will be devoted to classes, discussions and lectures on economic problems of world significance and economic topics of more immediate interest to the engineer with executive responsibilities. Members of the faculty of both colleges will participate in the discussions and there will be lectures by experts in engineering and economic fields. The afternoon of each day will be free for land and water sports.

The Stevens Engineering Camp is situated on a tract of 370 acres, on which the college has built a group of permanent buildings, including sixteen residence cabins scattered through the woods and a dining hall accommodating 170 men.

Memphis Building Code to Permit Garages in Basements

Storage garages in the basements of hotels and apartments are permitted by a change made in the city building code of Memphis as an aid to the solution of the parking problem. As soon as the change in the code was made the Hotel Gayoso announced that it would equip 75 apartments in the hotel with garage space in the basement.

By the terms of the code garages must be fireproof, and no gasoline will be permitted to be kept in them. Walls, ceilings and floors must be of concrete. A blower system for air circulation with an alarm bell which will ring when the circulation stops and a sprinkler system with an alarm bell are required.

Los Angeles Union Station Assured

In a decision rendered in the Los Angeles Union Station case on May 18 the U. S. Supreme Court sustained the ruling of the Supreme Court of California that the carriers can be compelled by the proper authorities to build the station. It was held formerly by the court that the Interstate Commerce Commission, while having the power to approve plans for a union station, could not demand its construction, whereupon the state commission of California issued the necessary order. The supreme court states in its opinion that state regulatory bodies may properly require the building of a union passenger station if such facilities are necessary to the public interest. In the present case, the court points out, public convenience and necessity require the construction of a union station in Los Angeles and the cost will not constitute an undue burden on the carriers.

Extensions of Water and Power Systems in Los Angeles

Providing for extensions and improvements to the city-owned water and electric system and for completion of land purchases in Owens Valley, the 1931-32 budget of the Los Angeles department of water and power has just been approved by the board of water and power commissioners. The budget, calling for $61,000,000, is the largest ever submitted by the department, according to Arthur Strasburger, president of the board of commissioners.

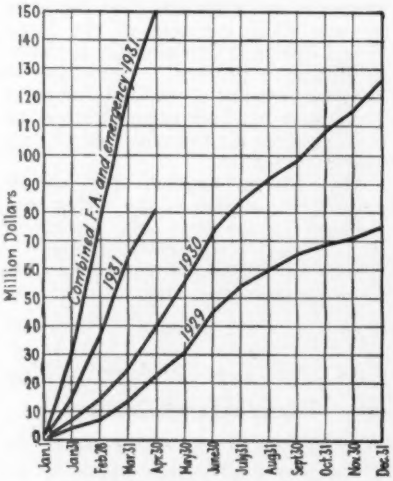
In approving the budget the commissioners have contemplated the following extensions and betterments to the water and power systems: Water: enlargement of the aqueduct capacity, construction of new storage reservoirs and enlargement of existing reservoirs, extensive well drilling in Owens Valley and the Los Angeles area, seven new pumping plants in Los Angeles, trunk lines from pumping plants to centers of use, six distributing reservoirs and tanks, filtration plant at the harbor. Power: improvements to the electric system, including installation of the third unit in power plant No. 2, providing 20,500-hp. capacity additional to the electric system; a new power-distributing station in Hollywood, extensions of underground electric conduits in Hollywood, Los Angeles and San Pedro.

Plan to Stabilize Building Industry in San Francisco

At a recent meeting of the Industrial Association of San Francisco a plan to assist in the stabilization of the building and construction industry was worked out and has been put into operation. The features of the stabilization plan are, first, to rotate employment wherever feasible on all jobs in order that as many mechanics and laborers as possible will get their share of the work available; second, to guarantee the San Francisco building trade mechanics and laborers the impartial wage board's scale in the various trades during 1931.

Seattle Planning $5,000,000 Shipping Terminal

With negotiations completed for the purchase of a large tract of land, the Seattle Port Commission will start development this summer of a shipping terminal to cost $5,000,000. The first unit will be a pier and transit shed 600 ft. long, costing about $500,000. It is intended ultimately to provide five large piers and complete equipment for handling heavy volume of shipping. J. R. West, chief engineer, will prepare plans.



FEDERAL-AID ROAD FUNDS

Graph prepared by the U. S. Bureau of Public Roads, showing the rates at which federal-aid funds were obligated in 1929 and 1930 and the rates to date in 1931 at which federal-aid and federal-aid and emergency funds combined have been taken up by the states. On May 1 the federal-aid program was eleven weeks ahead of 1930. On May 18 only $7,000,000 of the $80,000,000 emergency fund remained to be taken up by the states. All of the $80,000,000 is expected to be under contract by July 1.

Utah Adopts Building Safety Code

The industrial commission of Utah has adopted a building safety code for the state, to become effective July 1. The code prescribes regulations requiring modern and safe practice in building or demolition work and fixes penalties of $50 to $5,000 for violations.

Small Industries to Meet to Consider Problems

For the first time in the industrial history of the United States there is to be a convention of the smaller industries of the country. This gathering will be held on Aug. 10 at Lake George, N. Y., and the organizers hope that it will be an important step toward the solution of some of the problems of management that confront the smaller manufacturing industries. A statement issued by the National Industrial Conference Board says that, according to the latest available census figures, only 3.4 per cent of all manufacturing establishments in the United States employ more than 250 wage earners and only 1.4 per cent employ more than 500; also that 62 per cent of all industrial wage earners are employed in plants having a working force of 500 or less. The statement points out that while many of the problems of industry are similar, irrespective of the size of the establishment, it is also true that the applicability of a method for dealing with a common problem may depend largely on the size of the particular company. Harold F. Browne, of the National Industrial Conference Board, will act as chairman of the conference.

Contracts for Two New Bridges in United Kingdom

A contract has been let for building the new Carlisle Bridge across the River Foyle at Londonderry, Ireland. This contract, the successful bid for which amounted to $1,275,000, is for a steel bridge consisting of five 130-ft. spans and seventeen approach spans, making a total length of 1,260 ft. over all. It is estimated that the bridge will be completed in 2½ years. The engineers are Mott, Hay & Anderson, of London.

Another bridge recently contracted for in the United Kingdom is that which is to span the Tees at Newport, Middlesbrough. This bridge, which will cost about $3,000,000, is of the vertical lift type. It will be built by the Durham county council and the Middlesbrough town council.

The successful bidders in both cases were Dorman, Long & Co., who have in hand the $40,000,000 Sydney Harbor bridge in Australia, the Memorial bridge in Siam, the rolling bascule bridge in Liverpool, the Pretoria iron and steel works (costing $7,500,000), and two new London bridges—Putney Bridge ($2,165,000) and Lambeth Bridge ($2,500,000).

Work Progressing on Pacific Coast Railway Extension

Work is being carried on along the entire 200-mile line being constructed by the Great Northern Railway Co. and the Western Pacific from Klamath Falls, Ore., to Keddie, Calif.

The Great Northern reports construction 48 per cent completed on its 88-mile extension south from Klamath Falls. The Great Northern's part in the construction of the joint railway line involves grading with no tunnels and no large bridges. More than 300 men are employed on the construction of the extension. A. Guthrie & Co., Inc., St. Paul, Minn., and Portland, Ore., is the general contractor for the Great Northern construction.

The Western Pacific reports clearing nearly completed along its 112-mile extension north from Keddie. Grading on this section is 55 per cent completed, and good progress is being made on the driving of the ten tunnels. Foundations are being put in for some of the bridges. Steel is being erected for the viaduct at Keddie. The entire 112-mile project is between 30 and 40 per cent completed.

Baltimore to Have Smoke Commissioner

The Baltimore city council has passed an ordinance, which has been approved by Mayor Broening, providing for the appointment of a commissioner of smoke control. The commissioner must be an engineer. The new department will be a bureau in the department of public works, headed by the chief engineer of the city. No appointment has yet been made.

Capital and Construction

The week's issues of new capital totaled 96 millions. Three issues were chiefly responsible for this unusually large figure. These were: $19,337,000 Detroit 4s and 4½s for public buildings, water and street railway; $10,187,000 Newark 4s for schools, water, sewer, port work and street railway; $16,000,000 Puget Sound Power & Light Co. 4½s for plant additions. The accumulated totals of public and private securities are very evenly balanced: 954 and 917 millions respectively.

Contract total this year is 21 per cent below that of last year.

COSTS AND CONTRACTS

ENR Index Numbers

Cost			Volume	
May 1, 1931	189.33	April, 1931	289
Apr. 1, 1931	191.63	March, 1931	278
May 1, 1930	205.86	April, 1930	320
Average, 1930	202.85	Average, 1930	260
Average, 1929	207.02	Average, 1929	317
1913	100.00	1913	100

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of May 28, with some comparisons, total as follows:

(In Thousands of Dollars)

	May 28, 1931	Average of Last Four Weeks 1931	1930
Buildings:			
Industrial	$1,819	$3,151	$10,109
Other	19,167	18,504	29,363
Streets and roads	7,600	15,769	17,754
Other eng. constr.	11,270	17,244	31,141
Total	$39,856	$54,670	$88,368
Total, all classes, Jan. 1 to May 28:			
1931	$1,198,671		
1930	1,548,643		

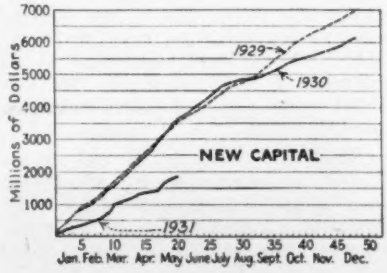
High-Level Suspension Bridge Projected for Vancouver

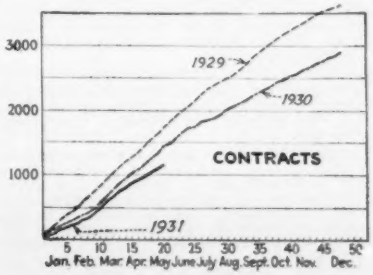
The Narrows Bridge Co., Ltd., of Vancouver, B. C., has completed plans for a high-level suspension bridge, carrying four streams of traffic, to cross Burrard Inlet over the First Narrows, the gateway to Vancouver's harbor. The plan is an alternative to building a tunnel under the channel, which is considered impracticable at the moment. The estimated cost of the bridge is $5,000,000. It will leave a free navigation channel of 1,400 ft. for marine traffic and will clear high water by 200 ft. Construction of the bridge is in line with recommendations by a royal commission which considered the subject in 1927.

Concrete Pavement Yardage

There is given below a tabulation of pavement yardage awarded in the United States during the month of April, divided according to roads, streets and alleys, and the totals as of May 2, 1931:

	Yardage Awarded During April, 1931	Yardage Awarded to Date of May 2, 1931
Roads	21,982,248	57,094,413
Streets	2,588,670	6,038,832
Alleys	100,243	244,786
Total	24,671,161	63,648,031





Personal Notes

WAYNE D. TINER, formerly city manager of Lufkin, Tex., is now associated with H. B. Zachry, of Laredo, Tex., in general contracting.

E. H. BRUNTLETT, of Minneapolis, is now located in Morton, Minn., where he is engaged in work preparatory to opening up a granite quarry for the United Building Stone Co., of Minneapolis.

JOHN H. PORTER, civil engineer, St. Louis, Mo., has been reappointed a member of the Missouri Public Service Commission for a six-year term by Governor Henry S. Caulfield.

JOHN T. EASTWOOD, for 25 years principal assistant and head of the engineering department of the New Orleans sewerage and water board, announces his retirement and that he has opened an office in New Orleans for consulting work.

A. B. CAMERON, chief chemist and superintendent of the water-softening and sewage-treatment plants at Fostoria, Ohio, has joined the J. N. Chester Engineers, Pittsburgh, Pa., as analytical chemist and will supervise the operation of water- and sewage-treatment plants.

NEIL B. PIERSON, Alameda and Oakland (Calif.) construction engineer and builder, has been appointed city manager of Alameda, effective May 1, to succeed Clifton E. Hickok, resigned. Mr. Pierson has been active in building and construction work in California for the past 25 years.

VIRGIL L. PETERSON, major, Corps of Engineers, has been authorized by the secretary of war to make a study of the Experimental Hydraulic Laboratory at Krunn, Bavaria. Major Peterson was a delegate to the Permanent International Association of Navigation Congresses recently held in Brussels, Belgium.

F. E. SWINEFORD, director of public service in Akron, Ohio, has been elected chief engineer of the Ohio Crushed Stone Association and will take up his new duties soon after the first of June. Mr. Swineford is a graduate of the civil engineering department of Ohio State University and served in the Ohio highway department from 1923 to 1926.

W. A. VAN DUZER, who recently resigned as assistant chief engineer of the Pennsylvania highway department and who is at present making traffic studies for the Park and Planning Commission, Washington, D. C., has been appointed director of vehicles and traffic of the District of Columbia, and will assume his duties on July 1.

H. E. HALE, vice-chairman of the Eastern group, President's Conference Committee on Railroad Valuation, New York, will establish an office for the practice of engineering, specializing in railroad and utility valuation, when the Eastern group office in New York closes on June 30. Mr. Hale has been vice-

chairman of the group since 1926 and engineer since 1914. Previous to that time he had been in railway service since his graduation from Lehigh University in 1897, first with the Pennsylvania and later with the Baltimore & Ohio and the Missouri Pacific. On both the latter roads he served as engineer, maintenance-of-way.

GEORGE S. BARTLETT, of Chicago, has been made assistant to the chairman of the board of the Portland Cement Association. Mr. Bartlett has been identified with the good roads movement in a number of states for twenty years and was one of the pioneers in securing the introduction of concrete for highway and street paving. He was recently retired from the Universal Atlas Cement Co. under the operation of the 70-year retirement rule of the United States Steel Corporation.

ARTHUR NEWELL TALBOT, consulting engineer, Urbana, Ill., and professor emeritus of engineering, University of Illinois, was awarded the George R. Henderson medal on May 20 at the Franklin Institute, Philadelphia. The citation stated that the award was made in consideration of his practical development of the "railway transition spiral" and for his creative guidance of the American Railway Engineering Association's tests on structural and track materials for railway buildings and maintenance which resulted in wide extension of the knowledge of such materials and in the promotion of safety in railroading.

Obituary

ST. JOHN CLARKE, consulting engineer, of New York City, died on May 22. Mr. Clarke, who was born in Richmond, Va., in 1863, first engaged in railroad work in the South and afterward was with the Passaic Rolling Mill Co., and for that company was engineer on the construction of the Washington Bridge and Macombs Dam Bridge over the Harlem River in New York. After leaving the Passaic company he entered the employ of Milliken Bros., steel contractors, and was engaged in the design and erection of steel buildings and bridges. Mr. Clarke next entered the New York City building department, and later became associated with William Barclay Parsons, chief engineer for the first Interborough subway, as general inspector for the predecessor of the present board of transportation. Resigning this post in 1905, Mr. Clarke became chief engineer on the construction of the Steinway tunnel, which connects the Grand Central Terminal and Long Island City. During recent years he had been consulting engineer on various engineering projects.

EDWARD D. ADAMS, a pioneer leader in the development of hydro-electric power at Niagara Falls, died on May 20 at his home in New York from injuries received in an automobile accident in Florida on March 29 while on his way to visit Thomas A. Edison at Fort Myers. He was 85 years old. Mr. Adams was born in Boston and was graduated from Norwich University in 1864. Later he attended the Massachusetts Institute of Technology, after which he was engaged for 54 years in business, during which he was director or officer in more than 40 firms or corporations engaged in transportation, manufacture, power development or other engineering enterprises. He organized, financed and directed the construction of various railroad enterprises, including the St. Paul & Northern Pacific Railway, the Northern Pacific Terminal Co., and the New Jersey Junction Railroad. He became interested in hydro-electric development at Niagara Falls in 1890. As president of the Cataract Construction Co., he directed the building of a central station for the distribution of the power, the complete story of which was told by Mr. Adams in a work of two volumes, "Niagara Power." Mr. Adams was invested with many honors from foreign countries and was the recipient of honorary degrees from Norwich University, Louvain University and Columbia University. He was a member of many scientific societies, including the American Society of Civil Engineers.

HARRINGTON EMERSON, of New York City, died on May 23 at the age of 77. Mr. Emerson was widely known for his advocacy of the adoption of efficiency methods in modern business and industry. In 1900 he formed Emerson Engineers as a practical means of putting his theories into practice, and remained president of that organization until 1923. In 1921 he was made a member of the commission for the elimination of waste in industry appointed by Herbert Hoover when he was secretary of commerce. He was the author of "Efficiency as a Basis for Operation," "The Twelve Principles of Efficiency," "A Course in Efficiency" and many pamphlets and essays. Mr. Emerson was frequently engaged by foreign governments and foreign private corporations as an engineering and industrial counsellor. At the time of his death he was preparing reports on unemployment for departments of the French and German governments. He also was an adviser to the Soviet government in the fundamentals of continental rail transportation in connection with the state railroads in Russia and was counsellor to the ministry of railroads of China.

CHARLES CLEMENT ELWELL, a member of the Connecticut Public Utilities Commission, died in New Haven on May 21 at the age of 74. Mr. Elwell was born in Belfast, Me., and was graduated in civil engineering from the University of Maine in 1878. For three years he was an engineer in the construction of lighthouses on the Southern coast. In 1882 he went to the old New York & Boston R.R. at Boston. Later he served the Wilmington & Delaware and the Baltimore & Ohio. Next he was roadmaster in charge of the New Haven road's four-tracking from New York to New Haven. When the Connecticut Public Utilities Commission was formed in 1911, he was selected as its chief engineer and four years later was made a member of the commission.

R. A. WYLIE, until May 1 of this year commissioner of streets and public property in Dallas, Tex., died of a heart attack on May 11, at the age of 55. Mr. Wylie was at one time in the contruction department of the Texas & Pacific R.R. and also spent some time as an engineer in South America. He was street commissioner of Dallas under two administrations.

EMMETT D. WOOD, of the Blaw-Knox Co., Pittsburgh, Pa., was killed in a motor accident on May 16. Mr. Wood was a graduate of Purdue University, class of 1916, and had a wide circle of friends among contractors.

SOCIETY CALENDAR

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York; summer meeting, Tacoma, Wash., July 8-10.

AMERICAN SOCIETY FOR TESTING MATERIALS, Philadelphia; 34th annual meeting, Chicago, June 22-26.

ILLINOIS ASSOCIATION OF SANITARY DISTRICTS will hold its eighth annual meeting at Peoria, Ill., on June 3 and 4. The secretary is Gus H. Radebaugh, Urbana, Ill.

MONTCLAIR (N. J.) SOCIETY OF ENGINEERS gave a reception on May 23 at the home in Essex Fells of Francis Lee Stuart, president of the American Society of Civil Engineers, to R. C. Falconer, assistant vice-president in charge of engineering work of the Erie Railroad. Mr. Falconer will soon be transferred, with other officials of the Erie, to Cleveland, Ohio.

NEW YORK SECTION, America. Society of Civil Engineers, at its annual meeting on May 20 elected the following officers for the ensuing year: president, George L. Lucas; vice-presidents, William F. Reeves and William J. Barden; secretary, William J. Shea; treasurer, Charles E. Trout. Announcement was made at the meeting that the constitutional amendment changing the name of the section to Metropolitan Section had been approved. R. C. Marshall, Jr., president, B-W Construction Co., addressed the meeting on "Stabilization of Employment Through Long-Range Planning of Public Works." His paper is abstracted elsewhere in this issue.

PACIFIC NORTHWEST SECTION, American Water Works Association, held its fourth annual meeting in Vancouver, B. C., May 14-16. The secretary reported 82 members, a gain for the year of 14. The program included papers on water-supply problems of the Northwest. Officers elected were: chairman, Fred J. Sharkey, Wenatchee, Wash.; vice-chairman, Carl F. Klapp, Everett, Wash.; secretary-treasurer, Ernest C. Willard, Portland, Ore.

PROVIDENCE ENGINEERING SOCIETY, at its annual meeting on May 19, elected the following officers: president, Prof. Leighton T. Bohl of Brown University; vice-president, Fred L. Itschner; treasurer, E. W. Freeman; secretary, James V. Baxter.

SMOKE PREVENTION ASSOCIATION will hold its 25th annual convention at Grand Rapids, Mich., June 30 to July 3. The secretary is Frank A. Chambers, Chicago.

VITRUVIUS CLUB has been organized in Babylon, Long Island, N. Y., as a medium for the exchange of ideas in the allied professions of engineering, architecture and landscape architecture. Charter members number 26; officers include the following: president, V. M. Caldwell; vice-president, B. R. Ringo; secretary, F. Cormier; treasurer, C. T. Ford.

Construction Equipment and Materials

Large Aluminum Plates to Be Produced by New Mill

Within the next two or three months the Aluminum Company of America will open at Alcoa, Tenn., what is said to be the world's first mill capable of producing aluminum plate in large sizes. The company expects to roll extra heavy plates up to 130 in. wide and 35 ft. long, and heavy plate 56 in. wide in strips as long as 75 ft. Such plates, in combination with the structural shapes now being produced at the company's mills at Messena, N. Y., will be used in the construction of railroad, trolley and tank cars and for many other uses.

New Steel Permits Hand Bending of Rigid Conduit

Rigid conduit in the smaller sizes which can be bent across the knee without tools is the newest improvement in wiring construction materials announced by the merchandise department of the General Electric Co., Bridgeport, Conn. The easy-bending properties have been obtained along with other desirable characteristics. The new material threads more easily, giving a clean-cut, firm-holding thread. The steel is fine grained and of uniform quality, so that the pickling and galvanizing processes give a smooth product. The new conduit also is cut more easily. These results follow the development of a new kind of flexible alloy steel, now used in all General Electric rigid conduit in the sizes that are adapted to hand-bending. Its flexibility also assures freedom from breaks that occur with more brittle types.

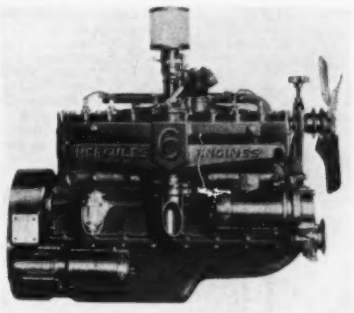
Truck Mixer-Conditioner Body

Rapid and uniform production of concrete is the function of a truck mixer unit for motor truck mounting which has been announced by the Blaw-Knox Co., Pittsburgh, Pa., and which can also be used as a closed-type agitating body for conveying premixed concrete. An octagonal mixing drum, tapered on both ends, is driven by a separate power unit through a transmission which automatically reverses the direction of rotation, thus giving a true end-to-end mixing action. Flat steel plates on the inside face of the drum are easily removed and replaced in short sections. The octagonal shape of the drum helps the mixing action, giving greater lifting and displacement than a cylindrical body. A forced feed automatic water-supply system is used which can be set for the amount of free water to be added to the batch and is entirely removed from the control of the truck driver. Water distribution within the drum is through a large pipe having four spray points amply protected from clogging. Water-supply tanks are carried beneath the chassis, which helps to lower the center of gravity of the unit. Discharge is through a door of the screw type. Truck mixers are available in capacities of 2, 3, 4 and 5 cu.yd. for mixing, and from 2 to 8 cu.yd. for agitating premixed concrete.

Octagonal truck-mixer body

Heavy-Duty Six-Cylinder Motors

Three six-cylinder motors with piston displacements of 228, 263 and 282 cu.in., respectively, are offered by the Hercules Motors Corp., Canton, Ohio, as companion models to the present series OO four-cylinder engines. Connecting rods, timing gears, valve mechanism and many other parts are interchangeable between the two series. All three of the six-cylinder JX series are identical in design and installation dimensions, and have a stroke of 4¼ in. The bores are 3⅜, 3⅝ and 3¾ in., respectively. Developed horsepower at 1,800 r.p.m., the maximum speed for continuous service under peak loads, is 46.5, 53 and 57; maximum horsepower is produced at speeds between 3,000 and 3,100 r.p.m.



Heavy-duty six-cylinder motor

Simplicity in design is one of the outstanding features of the JX series, which is said to be composed of fewer parts than any other engine of similar displacement. Design features include cylinders cast en bloc with detachable head, crankcase cast integral with the cylinder block, seven-bearing crankshaft, drop-forged connecting rods, gear pump lubrication, centrifugal pump cooling and mushroom-type valve lifter. Optional features include either downdraft or updraft intake manifold, exhaust manifod of either center or rear outlet type, three- or four-point suspension and magneto mounting. Provision is made for the installation of generator and starting motor.

Concrete Vibrator Fitted With Variable-Speed Control

Present knowledge of the art of concrete making favors the use of a minimum amount of water to obtain a quality product. This requirement naturally makes the placing of such concrete difficult if honeycombing, stone pockets and other defects are to be avoided. To settle and compact the dry concrete various types of mechanical equipment have been used for vibrating the forms without very much investigation into the effectiveness of such equipment. A study of the essential requirements for a vibrator made by A. W. Munsell, engineer of masonry inspection for the Port of New York Authority, in collaboration with the technical forces of Manning, Maxwell & Moore, Inc., 100 East 42d St., New York City, showed that there should be three main factors considered in the design of such a tool: the number of vibrations per minute; the amplitude of the blow; and the time of application.

Concrete vibrator

This study has resulted in the production of the Munsell Vibrator, consisting of an air-driven eccentric rotor with the number of vibrations controlled by the amount of air pressure. With 20 lb. per sq.in. 1,000 vibrations per minute can be obtained; with 85 lb. 3,000 vibrations. The consistency of the concrete to be placed is the controlling factor in choosing the proper frequency to be used. Wet mixers require about 1,000 vibrations per minute, while dry concrete favors the use of 2,500 vibrations and upward, depending on the amount of water used and the size of the mass to be moved.

The amplitude of the blow, which in this tool is ⅛ in., has a bearing on the type of form that can be used with this method of placing concrete. Other types of vibrating equipment require very rugged forms if distortion is to be avoided. This machine will accomplish

(Continued on page 914)

Current Construction Unit Prices

Covered Concrete Reservoir at Springfield, Mass.

EXTENSION of a covered masonry reservoir on Provin Mountain in the towns of Westfield and Agawam, Hampden County, Mass., was let in April, 1931, to E. H. Latham Co., 447 Neilston St., Columbus, Ohio, for $171,469. The new reservoir, a unit in the Springfield, Mass., system, is 288x224 ft. with capacity for 11,000,000 gal. It will be built on traprock, which is to be grouted. The general plan of the work is shown in the drawing. The north wall of the present reservoir, which will support the south wall of the new structure, is made stable by a rockfill placed against it. This fill must be removed in order to make the extension. All work that can be done before removing the rockfill will be completed, and then the water in the present reservoir will be lowered to 10 ft. below the elevation of the springline of the arches and maintained at that level for 75 days while the connecting work is being performed.

Part of the earth excavation in clearing the rock will be used for fill over the roof. Rock removed under items 2 and 3 is crushed and used as ballast for concrete and for fills of crushed stone. Excess earth and rock is disposed of within 1,000 ft. of the site. Item 4 covers filling over the top of the reservoir and over the gate chambers.

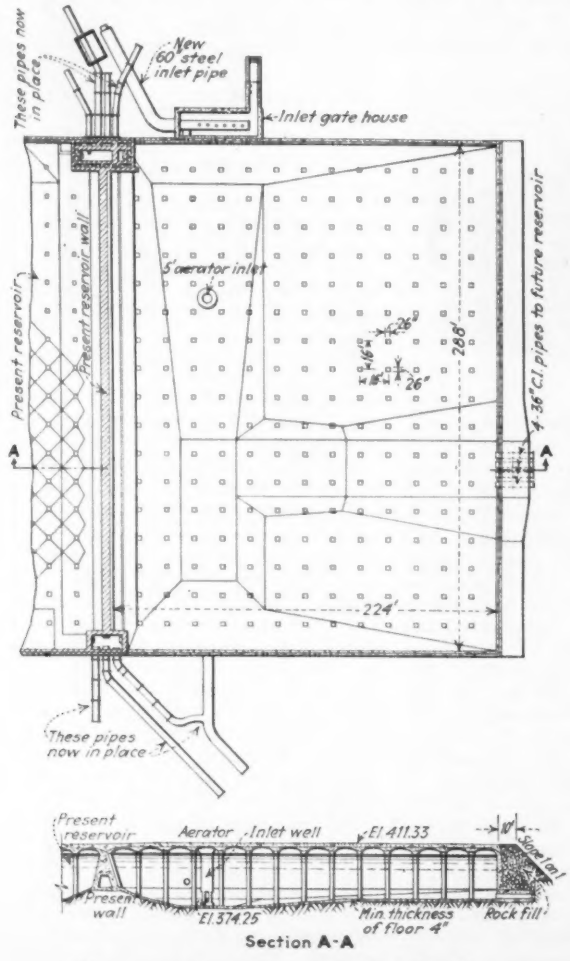
Concrete is of four classes. The mix for the groined arches comprising the roof and for the piers supporting them is 1 bbl. cement to 8 cu.ft. sand to 14 cu.ft. ballast, or 1.6 bbl. cement per cubic yard. For the walls of the reservoir and roof of the gate chambers, 1:9:16 of the units given above, or 1.4 bbl. per cubic yard. These proportions are used also for the floors and the gate chambers. For fill under foundations and around pipes, 1:11:19, or 1.2 bbl. per cubic yard. Time of mixing is at least three minutes.

Item 13 is for furnishing and laying 60-in. steel pipe and connecting it with the present 42-in. steel pipe inlet. The pipe is fabricated of steel plate with the longitudinal joints made either by welding or by lock bar. The cast-iron pipe under item 14 is furnished by the board of water commissioners and consists of 46 tons of 24-in. B.&S. in 12-ft. lengths, 84 tons specials, six 8-in. shear gates, six 24-in. hydraulic gate valves, one 42-in. hydraulic gate valve and one 36-in. geared gate valve and valve box.

Grouting is through 2-in. holes 10 ft. deep spaced 16 ft., one for each bay of the roof arches. Pressure is 20 lb. The lump-sum payment covers 250 holes with a total length of 2,500 ft. and 300 bbl. of cement.

Copper for both floor and wall joints is soft annealed sheet weighing 16 oz. per square foot. Joint spacing is not to exceed 32 ft.

Twenty bids were received; unit prices are given of the lowest two. E. E. Lochridge is chief engineer for the board of water commissioners; Hazen & Everett are consulting engineers.



New covered reservoir for Springfield, Mass.

BIDDERS ON PROVIN MOUNTAIN RESERVOIR

E. N. Latham Co., 447 Neilston St., Columbus, Ohio (A)	$171,469
Chas. Shaffer & Son, 42 Skillen St., Buffalo (B)	190,610
Monroe & Westcott, Inc., North Attleboro	206,805
R. J. Keating Co., 107 Kimball St., Fitchburg	209,505
S. J. Groves & Sons, Inc., 458 Sexton Ave., Minneapolis	210,400
Daniel O'Connell's Sons, Inc., 408 Hampden St., Holyoke	211,218
Cenedella & Co., 167 Main St., Milford	226,675
L. E. McLaughlin, Inc., New London, Conn.	233,835
C. W. Blakeslee & Sons, Inc., 58 Waverley St., New Haven	235,870
M. I. O'Connor, Northampton	249,080
Fred T. Ley & Co., Inc., Springfield	258,170
Macdonald Spencer Eng. Co., Inc., Graybar Bldg., New York	259,760
A. Phelps & Sons, 6319 Michigan Ave., Detroit	264,713
L. E. Meyers Constr. Co., 84 William St., New York	273,310
Gannett, Seelye & Fleming, Inc., Harrisburg	276,900
C. & R. Construction Co., 75 Braden St., Roslindale	293,125
Dravo Contracting Co., 302 Penn Ave., Pittsburgh	321,900
Erickson Equipment Co., Inc., 452 Lexington Ave., New York	337,270
Louis D'Angelo, Binghamton, N. Y.	352,260
T. Stuart & Son Co., Watertown	279,450
Average twenty bids	$253,016
Spread between low and average	32%

		A Unit	A Total	B
1	12,000 cu.yd. earth excav.	$0.50	$6,000	$0.55
2	4,000 cu.yd. excav. present rockfill	0.60	2,400	0.55
3	18,000 cu.yd. rock excav.	1.75	31,500	2.70
4	5,000 cu.yd. earthfill	0.40	2,000	0.60
5	15,000 cu.yd. rockfill	0.35	5,250	0.70
6	8,000 cu.yd. fill of crushed stone	1.31	1,048	1.50
7	3,100 cu.yd. conc., piers and vaulting	17.03	52,793	11.75
8	2,100 cu.yd. conc., walls	9.80	20,580	11.00
9	3,300 cu.yd. conc., floors	7.80	25,740	9.85
10	100 cu.yd. conc. for fill	6.33	633	9.60
11	350,000 lb. steel reinf.	0.033	11,550	0.04
12	1.5 acre seeding	200.00	300	180.00
13	20 ton steel pipe in place	226.00	4,520	225.00
14	150 ton place c.i. pipe and gates	16.00	2,400	10.00
15	250 hole grouting—lump sum	.....	2,855	
16	1,500 lb. copper joint	0.386	579	0.30

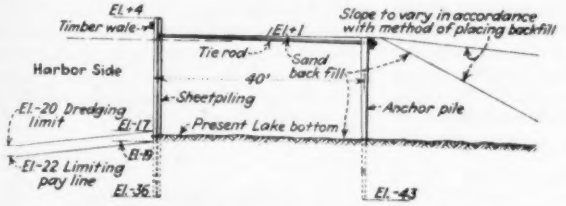
Montrose Harbor Retaining Wall, Chicago

CONTRACT for a retaining wall for Montrose harbor, Chicago, was let April 20, 1931, by the commissioners of Lincoln Park for $250,700. The work includes steel sheetpiling, anchor piles, anchor timbers, timber and structural steel wales, tie rods and backfilling. The wall is 4,600 ft. long and 22 ft. high by 39 ft. wide, as shown in the drawing. Backfilling is sand which may be obtained from any lake area a mile or more distant.

Anchor piles are of oak and driven 25 ft. into the bottom. They are 17 in. in diameter at the tip and 14 in. at the butt. A 60-ft. test pile is driven for each 500 lin.ft. of

retaining wall. Oak 12x12-in. anchor timbers are placed continuously back of the anchor piles. The timber wales are 8x12s.

Sheetpiling is of the deep arch type, 25 lb. per square foot of wall surface. The piling is reinforced by a steel wale formed of two 8-in. channels weighing 16.25 lb. per foot, bolted to the piling. The piling and anchor piles are tied as shown in the drawing. The sheetpiling is painted



Section through Montrose harbor retaining wall

one coat of bitumastic on the harbor side from the top down for a distance of 5 ft.

Five bids were received as given below. Hugh E. Young is consulting engineer for the commissions.

Fitzsimons & Connell Dredge & Dock Co., 108 South La Salle St., Chicago, was awarded on the same day a contract for dredging Montrose harbor. Price was 32c. for 450,000 cu.yd. of material. The five other bids were, respectively: 34¼c., 39½c., 42c., 49c. and 63½c.

	Per Lin.Ft.
Fitzsimons & Connell Dredge & Dock Co. (contract)	$54.50
Great Lakes Dredge & Dock	65.00
Mackie-Thompson-Tamm, Inc	72.50
Central Dredging Co	74.98
Congress Construction Co	85.00

Steel Highway Bridge and Concrete Overhead, Wisconsin

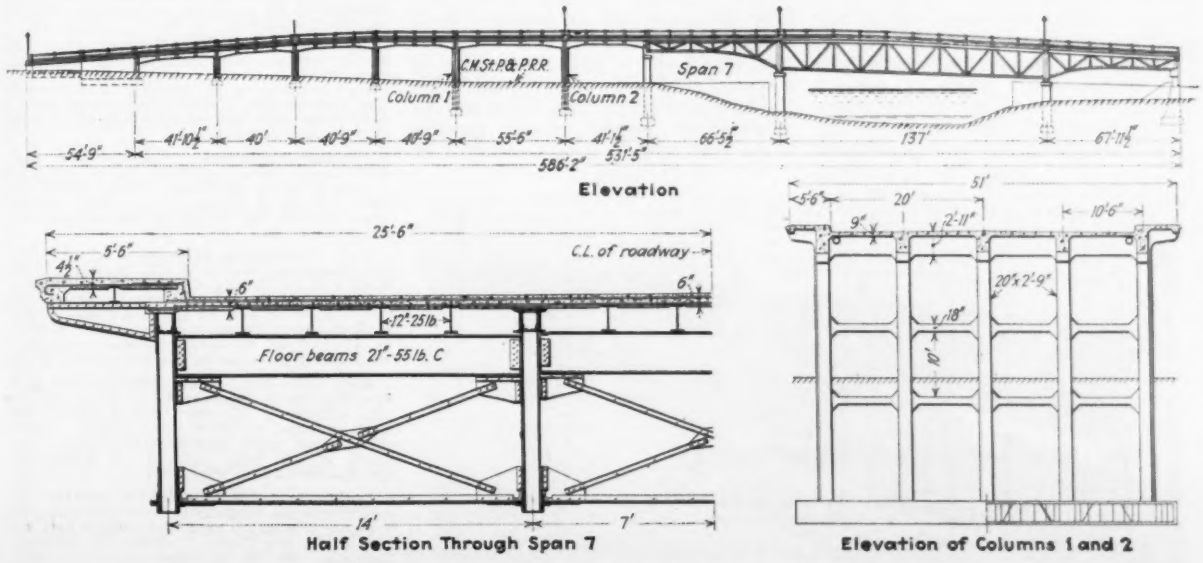
TURTLE CREEK highway bridge and approaches between the city of Beloit and town of Turtle Creek, Rock County, Wis., consists of six continuous concrete spans and three deck-truss spans having a total length of 531 ft. 5 in. back to back of abutments. The concrete spans are 42, 40, 41, 41, 55 and 41 ft., and the trusses are 67½, 137 and 68 ft. At the west end there are two 27-ft. concrete approach spans with retaining walls. Clear roadway is 40 ft., with two 5-ft. sidewalks.

Turtle Creek from streambed to normal water level is 4 ft., and 17½ ft. to high water. The principal items are concrete and steel. Given below are the unit prices of the low bidder, the averages of the thirteen bids, and the ratios of these items to the total cost.

	Unit Prices		Per Cent of Total Cost	
	Low	Average	Low	Average
1,938 cu.yd. concrete	$13.95	$15.74	25.1	24.9
3,295 bbl. cement	2.05	2.21	6.3	5.9
302,000 lb. reinf.	.037	.0395	10.4	9.7
580,130 lb. str. steel	.049	.0529	26.4	25.1

Unit prices are given of the three lowest bidders: A, Hensen-Beckman & Co., Beloit (contract); B, Cunningham Bros., Beloit; C, Wisconsin Bridge & Iron Works, Milwaukee. The last item on the list is the number of working days required to complete the contract. The time charge is $50 per day. The specifications required that the product of number of days times the charge be added to each bid and this is done in the tabulation.

	A	B	C
556 cu.yd. earth excavation	$0.40	$0.70	$0.40
20,380 cu.yd. borrow	.37½	.35	.35
2,877.2 sq.yd. pavement	.95	.72	1.25
443 lin.ft. ½-in. expansion joint	.10	.20	.05
160 lin.ft. 1-in. expansion joint	.15	.30	.10
24 lin.ft. concrete headers	.50	.25	2.00
935 bbl. cement	2.05	2.08	2.15
4,860 lb. reinforcing steel	.03½	.03	.034
335 lin.ft. curb-gutter removal	.15	.30	.20
1,496 sq.yd. pavement removal	.15	.30	.50
2 drop inlets	35.00	35.00	40.00
520 cu.yd. gravel surface	1.50	2.80	1.50
1,640 cu.yd. dry excavation	.50	1.15	2.00
385 cu.yd. wet excavation	5.50	8.75	7.00
1,937.07 cu.yd. concrete	13.95	14.00	14.00
3,295 bbl. cement	2.05	2.08	2.15
302,000 lb. reinforcing steel	.037	.0375	.034
18 floor drains	10.00	10.00	15.00
580,140 lb. structural steel	.049	.0497	.05
9,980 lb. cast steel	.12	.12	.12
4,240 lin.ft. piling, delivered	.50	.25	.50
4,240 lin.ft. piling, driven	.25	.30	.30
4,425 sq.ft. waterproofing	.015	.04	.04
40 lin.ft. 18-in. metal pipe	1.50	1.25	2.40
310 lin.ft. 18-in. vitrified pipe	1.75	1.35	3.40
15 lin.ft. 4-in. tile drain	.25	.60	.60
60 lin.ft. special curb and gutter	.70	1.25	1.50
45 lin.ft. 36-in. curb and gutter	.45	.70	1.50
196 lin.ft. 6-in. curb and gutter	.40	.70	1.00
774.4 lin.ft. 8½-in. curb and gutter	.60	.80	1.00
32 lin.ft. concrete flume	1.00	2.00	2.00
Removal old bronze	500.00	500.00	1,400.00
96 sq.yd. sidewalk	.75	1.40	1.00
750 lb. phosphor bronze	.40	.80	.40
1,134.75 lin.ft. ornamental railing	5.95	5.75	5.15
Placing ten lamp standa	3.00	10.00	3.00
277 sq.ft. sheet lead	.85	1.00	.50
79 sq.ft. zinc separator	.35	.65	.50
77.5 lin.ft. conduit pipe	.30	.35	2.00
188 light wire hooks	.50	.35	.25
152 lin.ft. temporary bridge	25.00	19.00	20.00
Subtotal	$107,901.96	$109,770.99	$112,830.05
Working days	145—$7,250	175—$8,750	140—$7,000
Grand total	$115,151.96	$118,520.99	$119,830.05



Elevation and details of Turtle Creek crossing, Wisconsin

Concrete Vibrator

(Continued from page 911)

its purpose with comparatively light blows at high frequency.

The time of application will depend on the consistency of the concrete and the type of structure on which the vibrator is used. For dry concrete it may take two minutes to level off and consolidate, but in thin sections it should be applied not longer than one minute in any one location. Excessive use will bring the large aggregate to the surface and make a non-uniform texture when such surfaces are exposed.

The Munsell vibrator, in two forms, is distributed by Manning, Maxwell & Moore. Type A, illustrated, is portable, with an over-all length of 30 in. and a weight of 35 lb. It is equipped with a trigger valve for controlling the number of vibrations. Type B is of the same length but is fitted with a vise for clamping directly on the forms. A sleeve-type single-speed valve is supplied with type B machines.

Aluminum Chain Hoist

Aluminum alloys are the basic materials used in the manufacture of the Al-Lite chain hoist announced by the Chisholm-Moore Hoist Corp., Tonawanda, N. Y. Besides resulting in a one-third reduction in weight, the hoist is thus given resistance to corrosion and ready portability. It is designed for easy accessibility and is equipped with Alemite lubrication, hardened and ground ball bearings, planetary type gears, dustproof housing and an adjustable brake.

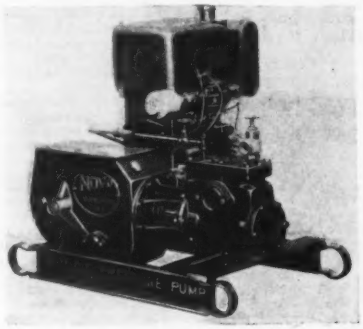
All-Steel Safety Zone

In an attempt to provide a street safety zone giving better protection to the pedestrian, the Blaw-Knox Co., Pittsburgh, Pa., has devised a platform made entirely of structural steel. Pipe or I-beam posts are set into the pavement, to which are anchored I-beam base members, splash plates and guard rails. Channels supported on the I-beam members contain fitted panels of non-slip grating with a sloping ramp to afford easy entrance, although the entire platform is only 8 in. above the street level. The platform can be entered only from one end, usually that adjacent to the intersecting street. The opposite end is properly buttressed to avoid danger from traffic, and is equipped with signal lights and markers. Illumination of the platform itself is by floodlights attached to guard rail. Easy draining through the open flooring prevents the accumulation of ice or snow, and the twisted crossbar construction of the grating affords many points of friction contact with the shoe. Because of the flexibility in design of the platform, it can readily be taken up, moved to another location or changed in size when such a course is desirable.

Pedestrian platform designed for safety

Pressure Pump and Motor Built as Single Unit

Thorough lubrication is the outstanding feature of the gasoline engine-pressure pump combination recently announced by the Novo Engine Co., Lansing, Mich. By supplying the pump crankcase with oil, all gears, bearings, pins and crosshead are constantly lubricated. The pump is of the double action type, and both pump and engine have all working parts completely inclosed from dirt and weather. Compact design and light weight make the unit easy to move and to install. It is mounted on a welded steel channel base with steel loops to facilitate moving, or a special steel truck can be furnished.



Pressure pump unit

The power supply is a Novo one- or two-cylinder hopper cooled gasoline motor with roller-bearing crankshaft, or an electric motor. Engine and pump form a single integral unit, as the pump crankcase is bolted directly to the engine block. A steel roller chain runs directly from the crankshaft of the engine to the countershaft of the pump. Between countershaft and pump shaft there is a wide-face gear reduction running in a bath of oil. The pump cylinder is attached to the case by a bracket which carries packing glands for both ends of the piston rod. Units are available in from 3- to 8-hp. sizes, displacing from 18 to 46 gal. per minute under heads in the neighborhood of 400 ft.

New Publications

Standards—AMERICAN STANDARDS ASSOCIATION, 29 West 39th St., New York City, has issued its year book for 1931. This 102-p. volume gives a full account of the membership and administration of the organization, its relations with other associations and governments, and its aims and accomplishments. In addition, a list of all projects that have an official status before the association is given.

Tractor-Powered Equipment — Products of more than 100 manufacturers using the McCormick-Deering industrial tractor as the basis for special equipment are listed in a large catalog, "McCormick-Deering Industrial Tractor and Operating Equipment," published by the INTERNATIONAL HARVESTER COMPANY OF AMERICA, 606 South Michigan Ave., Chicago, Ill. This volume is divided into nineteen sections, each of which deals with a specific type of machine. Classifications include air compressors; cranes, shovels and backfillers; ditchers; dump wagons and bodies; hoists and winches; locomotives and rail cars; snow-removal equipment; stone crushers, and many other varieties.

Pipe Welding—Welded steel and wrought-iron piping systems for industrial uses are the subjects covered in a 44-p. booklet issued by the GAS PRODUCERS ASSOCIATION, 250 East Ontario St., Chicago, Ill. This is an organization of independent manufacturers of gas welding and cutting equipment and supplies. The subjects covered include alignment, spacing, templets, special connections, expansion loops and many others. In addition there are tables of cost data for the welding and cutting of all sizes of pipe from ⅜- to 30-in. diameter. The book is priced at 50c. per copy.

Gasoline Engines—Differences between the high-duty gasoline engine and the so-called industrial engine form the basis of an illustrated bulletin issued by the STERLING ENGINE CO., Buffalo, N. Y., which explains the essential points that should be considered in choosing an engine for a specific purpose.

Instruments—WARREN-KNIGHT CO., 136 North Twelfth St., Philadelphia, Pa., has published the seventh edition of its illustrated catalog on engineering and surveying instruments. This contains 64 pages describing and illustrating transit, levels, tripods and accessories.

Roofing—Corrugated roofing and side wall sheets which function as a series of beams to carry unusually heavy loads are described in a folder, "Steel Roof Decks Plus," issued by the H. H. ROBERTSON CO., Pittsburgh, Pa.

Belt Conveyors—Bulletin 40-1 of the FAIRFIELD ENGINEERING CO., Marion, Ohio, describes Fairfield portable belt conveyors, made in lengths of from 20 to 60 ft. for handling sand, gravel, crushed stone, mixed concrete and similar materials. Belt widths of 20 and 24 in. are available, equipped with either gasoline or electric power units.

Sanitation Equipment—Photographs and descriptions of typical plants using Hardinge clarifiers, digester tank mechanisms, flush pumps, aerators, coagulation units, driers and other sanitary equipment are given in an 18-p. bulletin 35 issued by the HARDINGE CO., York, Pa.

Lightweight Roofing—A 48-p. catalog 108 describing the various types of lightweight concrete insulation roof slabs made and installed by the FEDERAL-AMERICAN CEMENT TILE CO., can be obtained from the office of the company at 608 South Dearborn St., Chicago, Ill.

CONSTRUCTION NEWS

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Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue.

Location	*Project*	*Cost*	*Status*
Waterworks			
Jamestown (Pa.)	Dam, etc.	$1,500,000	Proposed
Sewers			
Lancaster (Pa.)	Trunk sewer	1,000,000	Proposed
Bridges			
Los Angeles	Viaduct	1,420,223	Contract
Indiana and Kentucky	Bridge	1,348,500	Contract
Excavation and Dredging			
Brownsville (Tex.)	Irrigation system	1,500,000	Proposed
Raymondsville (Tex.)	Irrigation system	7,500,000	Proposed
Unclassified			
Texas	Oil pipe line	5,000,000	Proposed
Texas	Oil pipe line	3,500,000	Proposed
Federal Government			
Louisville	Post office	2,985,000	Bids asked
Factories and Mills			
Cleveland	Factory	1,000,000	Bids asked
Buildings			
New York	Apartment	10,000,000	Separate Contracts
New York	Hotel, 40-story	2,500,000	Separate Contracts
Hackensack (N.J.)	County administration	1,200,000	Bids asked
Los Angeles	University	1,000,000	Proposed
Suffield (Conn.)	School group	1,000,000	Proposed

WATERWORKS

PROPOSED WORK

Pa., Jamestown — Commonwealth of Pennsylvania, Dpt. Forests & Waters, Harrisburg, 1,700 ft. earth dam, 50 ft. maximum height, concrete spillway, creating reservoir in Mercer Co., near here. $1,500,000. C. E. Ryder, Harrisburg, ch. engr. Water & Power Resources.

BIDS ASKED

Mass., Leominster—See "Contracts Awarded."

N. J., Wayne—Twp. Com., Municipal Bldg., bids about July 1, mains along Pompton Turnpike, from Pequannock to Singac Bridge, with also laterals through Preakness Rd. to French Hill, and from Prospect Ave. to Pompton Turnpike. $170,000. W. Ferguson, 152 Market St., Paterson, engr.

N. Y., Schroon Lake — June 4, by Water Comrs. Schroon Lake Water Dist., Town Hall, 6- to 10-in. c.i. mains, valves, hydrants, earth dam, intake structures, chlorinator, and house for same with automatic pressure control, and relief valves. Solomon & Keis, 257 Bway., Troy, consult. engrs.

Tex., Dumas—See "Contracts Awarded."

Wis., Fox Point—June 4, by C. S. Whitney, engr., 214 Mason St., Milwaukee, 42,479 ft. 6- to 12-in. mains in Calumet Rd. for Village of Fox Point.

CONTRACTS AWARDED

Mass., Leominster—City, grading, improving water shed, new dam, dyke at North Reservoir, day labor. $100,000. W. P. Ray, 42 Main St., engr.

New York—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Jerome and Webster Aves., Bronx Boro, and Bronx River Rd., Yonkers, to Oakhill Contg. Co., 123 Nagle Ave., New York, $108,342. Noted May 7.

Tex., Dumas—West Texas Utilities Co., Abilene, extending 35,000 ft. water mains at Dumas, Sunray and Stratford, also extending gas mains incl. 12,000 lin.ft. c.i. pipe screw and welded joints at Stratford, new high line extension running to Etter 30 mi. east of Dalhart, company forces using mostly day labor. Private plans.

SEWERS

PROPOSED WORK

N. J., Elizabeth—Bd. City Comrs., City Hall, soon takes bids storm water sewer in Newark Ave. $25,000. T. Collins, city engr. Noted May 21.

N. J., Little Falls—Township Com., Municipal Bldg., extending, enlarging sewage disposal plant. $123,000. Project in abeyance. J. Boughton, twp. engr. Noted Apr. 9.

N. J., Newark—Bd. City Comrs., City Hall, preliminary plans storm water sewer in Haynes Ave. Sewer Sect. 3. $25,000. J. Costelle, city engr.

N. J., South Amboy—Bd. City Council, City Hall, will not build sewage disposal plant. $25,000. Project abandoned. Engineer not selected. Noted Mar. 5.

BIDS ASKED

Conn., Newton—June 2, by H. B. Senior, chn. Building Comn., c/o State Water Comn., State Capitol, Hartford, sewer pipe, sludge beds, filter beds, Imhoff cement tanks, appurtenances for sewage disposal plant at State Insane Asylum. To exceed $25,000. J. Lynch, West Haven, engr. W. P. Crabtree, Sr., 410 Asylum St., Hartford, architectural layout. Noted May 21.

Kan., Wichita—June 4, by C. C. Ellis, city clk., complete sewage disposal plant, auxiliary piping. Black & Veatch, 700 Mutual Bldg., Kansas City, Mo., engrs.

N. Y., Brooklyn—June 3, by H. Hesterberg, pres. Brooklyn Boro, Boro Hall, sewers in Glenwood Rd. and East 86th St.; storm sewer in East 26th St.

N. Y., Long Island City—June 1, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., sewers in 62nd Dr., Horace Harding Blvd., 63rd, 62nd, 146th Aves., 21st and 156th Sts.

N. Y., New York—June 3, by S. Levy, pres. Manhattan Boro, Municipal Bldg., sewers in 10th and 11th Aves., 40th, 42nd, 43rd, 44th, 45th and 46th Sts., in connection with west side improvement of New York Central R.R.

N. Y., Oxford—June 5, at office Executive Dpt. Div. Standards & Purchase, Capitol, Albany, F. L. Morris, supt., sewers and waterlines at New York State Women's Relief Corps Home.

CONTRACTS AWARDED

Pa., Pittsburgh—M. C. Smith, secy. Shaler Twp., Mt. Royal Blvd. 66,801 ft. 8- to 24-in. terra cotta sewers, 400 manholes, 64 lampholes in Shaler Twp., Dists. 1, 1-A, 2 and 3, to Sharpsburg Contg. Co., Sharpsburg, $169,195. Noted Dec. 4.

Tenn., Memphis—City Council, 57 mi. sewers in Hollywood and North Memphis, to Riley Contg. Co., 110 North 7th St., St. Louis, Mo. $169,120. Noted Apr. 23.

WASTE DISPOSAL

PROPOSED WORK

Pa., Altoona—City, B. Keatley, dir., Dpt. Streets & P. Impvts., City Bldg., revised plans, 2 story, brick, concrete incinerator, water cool furnace type. $50,000. Former bids rejected. H. J. Baum, City Bldg., engr. Noted Apr. 23.

BRIDGES

PROPOSED WORK

B. C., North Vancouver—Burrard Inlet Bridge & Tunnel Co. Ltd., soon takes bids replacing 300 ft. span of bridge over 2nd Narrows, that was damaged by ship. Private plans.

BIDS ASKED

Mass., Hinsdale—June 2 by Dpt. P. Wks., State House, Boston, A. W. Dean, engr., 1,621 ft. steelplate girder bridge with 520 ft. bituminous macadam and gravel approach over Boston & Albany R.R., for Commonwealth of Massachusetts, Dpt. P. Wks., Boston.

Tex., New Braunfels—June 1, by Comal Co., c/o Judge, 3 span, rein.-con., rigid frame bridge over Comal River. $35,000. J. W. Beretta Engineers, Inc., Natl. Bank of Commerce Bldg., San Antonio, engrs. Noted Mar. 19.

CONTRACTS AWARDED

Calif., Los Angeles—Bd. P. Wks., City Hall, Sixth Street Viaduct, incl. 8,000,000 lb. reinforcing steel, 47,300 cu.yd. Class F and 500 cu.yd. Class G Concrete, 37,015 ft. concrete pipe, 1,200 tons structural steel, sanitary sewers, storm drains, structure complete, except fabrication and erection structural steel, to J. K. Knapp, Financial Center Bldg., Oakland, $1,272,525; steel fabrication to Virginia Bridge & Iron Co., 323 West 6th St., $112,330; erecting steel, to Allan Bros., Inc., 1925 South Alameda St., $35,368. Grand total $1,420,223. Noted Apr. 9.

Ill., Chicago—Sanitary Dist. of Chicago, 910 South Michigan Ave., J. J. Sullivan, clk., viaduct, approaches to Harlem Ave. Bridge, Harlem Ave. from 63rd to 71st Sts., to Minder Constr. Co., 228 North La Salle St., $158,170.

Indiana and Kentucky—Spencer County Bridge Comn., Rockport, Ind., L. C. Anderson, vice-pres., toll bridge over Ohio River, from Rockport, Indiana Rd. 45 to Kentucky, to Nashville Bridge Co.; foot of Shelby St., Nashville, Tenn., $1,548,500.

Massachusetts — Dpt. P. Wks., State House, Boston, 535 ft. 3 span steel truss hy. bridge with 2 steel girder approach spans, concrete piers, abutments, 1,500 ft. bituminous macadam approaches, Deerfield and Greenfield, to Daniel O'Connell's Sons, Inc., 480 Hampden St., Holyoke, $243,794. Est. $300,000. Noted May 7.

New Jersey—State Hy. Comn., Trenton, bridge over Deal Lake, Monmouth Co., to Whittaker & Diehl, Harrisburg, Pa., $155,755. Noted Apr. 16.

New York—A. W. Brant, comr. Hys., Albany, bridges in Tompkins Co., to H. A. Carhart, Minoa, $7,711 est. $10,339—in Monroe Co., to Scott Bros. Constr. Co., Inc., 31 Exchange St., Rochester, $2,074 est. $94,882 — in Albany Co., to J. Boochi, Hudson Falls, $78,627 est. $122,635. Grand total $148,412. Noted Apr. 16 and 23 under "Streets and Roads."

New York — A. Goldman, comr. Plant & Structures, Municipal Bldg., New York, Queens Anchorage Triborough Bridge, connecting Manhattan, Bronx and Queens Boros, to A. McMullen Co., 50 Church St., New York, $868,900. Noted Apr. 30.

N. Y., Brooklyn—A. Goldman, comr. Plant & Structures, Municipal Bldg., New York, installing electrical operating system on Harway Ave. Bridge, to Miller Brown, Inc., 31 Union Sq., New York, $28,900. Noted May 7.

Ohio and West Virginia—Mt. Vernon Bridge Co., (owner and contractor) Mt. Vernon, O., bridge between Brilliant, O., and Wellsburg, W. Va., $750,000; footers, to B. O. Cresap Contg. Co., Wellsburg, W. Va.

O., Cleveland — Bd. Comrs. Cuyahoga Co., rein.-con. bridge over Wolf Rd., to Hecker-Moon Co., 8701 Union Ave., stone rail, $57,396. Est. $93,141. Noted Apr. 30.

See proposal advertising on page 79

Constr. News page 229

LEADITE

Trade Mark Registered U.S. Pat. Office

LEADITE

—is an acknowledged "Standard of Comparison" for self-caulking jointing materials, for use on Bell & Spigot Water Mains.

Proof of this statement, lies in the fact that many specifications and bidding forms (of various municipal water plants) contain the clause:

Leadite or Equal

Here again, the question arises as to WHAT IS MEANT BY "EQUAL"?

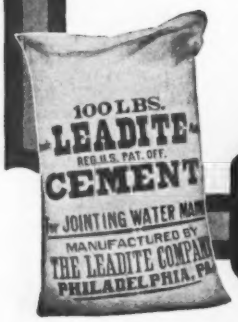
To us, for a product or device to be classified as equal to any other product or device, it "MUST" be capable of serving exactly the same purpose and doing so with the same resultant degree of satisfaction (otherwise it is NOT EQUAL).

Usually the product, or device which is used as the STANDARD FOR COMPARISON, has been widely approved and used,—has proven its true worth through years of actual service,—has met every test required,—and is, in short, dependable and satisfactory.

So, when it comes to specifying a jointing material for Bell and Spigot Pipe, we believe that "every angle" of economy, efficiency and reliability should be CAREFULLY CONSIDERED, before purchasing,—for then, and then only will be found the real answer to the "OR EQUAL" QUESTION, as well as the answer to the question of "WHY" LEADITE may be higher in "first cost."

The pioneer self-caulking material for c.i. pipe.
Tested and used for over 30 years.
Saves at least 75%.

THE LEADITE COMPANY
Land Title Building, Philadelphia, Pa.



No Caulking

STREETS AND ROADS

BIDS ASKED

Calif., Antioch—June 8, by J. E. McElehny, city clk., grading, sewers, c.i. pipe, 5 in. concrete paving 145,000 sq.ft. Wills Addition.

Calif., San Luis Obispo — June 2, by L. H. Gibson, dist. engr., State Hy. Comn., Bank of Italy Bldg., oil treated gravel surfacing 3.2 mi. road between Priest Valley and East Boundary, Monterey Co.

Delaware—June 10, by State Hy. Dpt., Dover, clearing, grubbing, grading, concrete paving 3.3 mi. Whitehall Neck Road-Mott's Corner, Contr. 172—3.515 mi. Brown's Church-Middleford, Contr. 189—grading, borrow, broken stone base course, concrete paving 3.674 mi. Port Penn-Delaware City, Contr. 186—surface treating 28 mi. Contr. 195; adv. E. N.-R. May 28.

Indiana — June 2, by State Hy. Comn., Indianapolis, puddle macadam, bituminous retread or bituminous coated aggregate surfacing 7.105 mi. Project N, Federal Aid Project 275, Sect. A, State Rd. 43 from Cloverdale south, 20 ft., Owen and Putnam Counties — rock asphalt, bituminous concrete or asphaltic macadam surfacing 8.85 mi. Contr. 138, State Rd. 40 from Cumberland to Greenfield, 30 ft., Marion and Hancock Counties—5.069 mi. Contr. 150, State Rd. 43 from Westville south, 20 ft., Laporte Co. J. J. Brown, comr.

Indiana—June 3, by State Hy. Comn., Div. Maintenance Indianapolis, Invitation 7251, 532,000 gal. road oil and 297,000 gal. bituminous surface treatment on roads in Crawfordsville Dist.—Invitation 7252, 340,200 gal. road oil treatment and Invitation 7253, 240,750 gal. bituminous surface treatment on roads in Ft. Wayne Dist.—Invitation 7254, 430,000 gal. road oil treatment and Invitation 7255, 413,900 gal. bituminous surface treatment on roads in Greenfield Dist.—Invitation 7256, 136,700 gal. road oil and Invitation 7257, 417,350 gal. bituminous surface treatment on roads in La Porte Dist.—Invitation 7258, 244,000 gal. road oil treatment and Invitation 7259, 973,700 gal. bituminous surface treatment on roads in Seymour Dist. — Invitation 7260, 1,136,500 gal. road oil and Invitation 7261, 265,525 gal. bituminous treatment on roads in Vincennes Dist. J. J. Brown, dir.

Ind., Brookville — June 1, by Bd. Comrs. Franklin Co., concrete surfacing 20,479 ft. John A. Dudley Rd. $51,738. W. F. Flack, Brookville, co. aud.

Ind., Valparaiso — June 6, by Bd. Comrs. Porter Co., concrete surfacing R. S. Moore Rd. $40,471.—F. W. Ludington Rd. $22,723.—A. G. Knoblock Rd. $14,043. C. A. Blachly, Valparaiso, co. aud.

Ind., Vincennes—June 2, by Bd. Comrs. Knox Co., concrete surfacing Sarah Williamson, Julius Dreiman and John Oxman Rds. $29,526. H. C. Sloan, Vincennes, co. aud.

Kansas—June 4, by State Hy. Comn., Court House, Dodge City **(P. means Project, K.P. Kansas Project and F.A.P. Federal Aid Project)**, bituminbus surface mix surfacing 16.061 mi. P. 508-10, F.A.P. 437-A—bituminous blotter treating 18.27 mi. P. 21-5, F.A.P.233-B, both Ford Co.—18.751 mi. P. 96-9, F.A.P. 279-B, Gray Co.—13.865 mi. P. 54-4, F.A.P. 408-B—1.609 mi. P. 54-3, F.A.P. 369-A—2.951 mi. P. 54-3, F.A.P. 369-B, all Seward Co.—3 mi. P. 54-5, F.A.P. 408-A—8.31 mi. P. 54-5, F.A.P. 408-C—5.039 mi. P. 54-5, F.A.P. 42-A, all Meade Co.—1.962 mi. P. 21-4, F.A.P. 233C, Clark Co.—6 mi. P. 73-6 and 7, K.P. 7415, Haskell Co.—10.36 mi. P. 508-11, K.P. 7416, Ford Co.—1 mi. P. 50-1, K.P. 7417, Hamilton Co.—sand gravel or chats surfacing 12 mi. P. 96-3, K.P. 7418—12 mi. P. 96-4, K.P. 7419, both Wichita Co.—mortar bed surfacing 10.27 mi. P. 96-7, K.P. 7420—12.462 mi. P. 96-8, K.P. 7421, both Lane Co. W. V. Buck, Topeka, hy. engr.

Maryland—June 2, by State Roads Comn., G. C. Uhl, chn., Baltimore, concrete paving 3.25 mi. Contr. Ce-58-22, Cecil Co.—gravel paving 1.48 mi. Contr. Ch-104-82, Charles Co.—1.02 mi. Contr. SM-84-82, St. Mary's Co. — 1.14 mi. Contr. SM-85-84, St. Mary's Co.; adv. E. N.-R. May 28.

New Hampshire—June 4, by State Hy. Dpt., Concord, 6 in. one course rein.-con. on 8 in. gravel base course surfacing 43,441 sq.yd. Rockingham Rd., Londonderry. $111,000. W. N. Prescott, Concord, engr.

N. Y., Brooklyn—June 3, by H. Hesterberg, pres. Brooklyn Boro, Boro Hall, grading, curbing, flagging Ludlam Pl., Lenox and Clarendon Rds., Scott, Shepherd, 10th, 11th, 23rd Aves., East 12th, East 29th, Ford, Rodman, West 13th Sts.; grading, asphalt on concrete paving South Elliott Pl., Clarendon Rd., 10th, 11th, 23rd Aves., 61st, Willoughby, South 4th, Danforth and Cooper Sts.

N. Y., Long Island City—June 1, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., grading, curbing, sidewalks on Queens Blvd., 54th, Penelope, 28th, 34th, 52nd, 35th, 39th, 115th Aves., 68th, 64th, 115th, 89th, 159th, 160th, 136th Sts.—grading, sheet asphalt on macadam paving 14th St., Queens Ave., Foster Meadow, Rocky Hill, Black Stump and Little Neck Rds.—grading, sheet asphalt on concrete paving Van Alst Ave., 68th, 64th, 115th, 89th, Sprague, 97th, 61st, 159th, 160th, 75th Sts.

Oklahoma—June 2, by State Hy. Dpt., Oklahoma City, concrete slab surfacing 58,665 sq.yd. U. S. Hy. 66 near Weatherford, $50,000—58,665 sq.yd. U. S. Hy. 66 near Weatherford, $50,000—58,665 sq.yd. U. S. Hy. 66 near Indianapolis, $50,000—58,665 sq.yd. U. S. Hy. 66 near Clinton, $50,000, all foregoing Custer Co.—58,665 sq.yd. U. S. Hy. 66 near Bridgeport, $50,000—46,860 sq.yd. U. S. Hy. 66 near South Canadian River, $40,000—58,700 sq.yd. U. S. Hy. 66 east from Custer Co. Line, $50,000, all foregoing Caddo Co. A. R. Losh, hy. engr.

Pennsylvania—June 5, by State Hy. Dpt., Harrisburg, one course rein.-con. surfacing 13,060 sq.yd. Route 56, Sect. 2, College and Benner Twps., Centre Co.—grading, drainage structures, bridges, one course rein.-con. or bituminous surface treated macadam with or without broken stone base 29,762 sq.yd. Route 380, Sect. 1, Farmington Twp., Clarion Co. — 54,745 sq.yd. Route 436, Sect. 2, Gaskill, Banks and Bell Twps., Jefferson, Indiana and Clearfield Counties—72,452 sq.yd. Routes 407 and 280, Coney and East Donegal Twps., Lancaster Co.—53,074 sq.yd. Route 353, Sect. 1, Mifflin, Cummings and Cogan House Twps., Lycoming Co.—33,630 sq.yd. Route 255, Lackawaxen Twp., Pike Co.—58,726 sq.yd. Route 310, Wayne Twp., Schuylkill Co. S. S. Lewis, secy.

Pa., Greensburg—May 29, by J. A. Kell, clk. Westmoreland Co., Court House, rein.-con. repaving 7,948 ft. Latrobe and Youngstown Rds. $25,000-$40,000. W. A. Wynn, Court House, engr.

Pa., Greensburg—June 1, by H. Wising, city clk., City Hall, curbing, 7 in. rein.-con. paving 5,633 ft. Alley S. of W. Otterman St., and Hamilton Ave., 15 and 24 ft. $50,000. F. E. Maddocks, City Hall, engr.

Pa., Munhall—May 29, by L. Y. Woodward, city secy., Municipal Bldg., grading, curbing, concrete paving 31 streets. $300,000-$500,000. F. B. Shafer, Municipal Bldg., engr.

Tennessee—June 3, by State Dpt. Hys. & P. Wks., Nashville, grading, plain concrete surfacing 34,751 sq.yd., rein.-con. surfacing 192 sq.yd. Federal Aid Project 253-A Extension, Dyer Co. R. H. Baker, hy. comr.

Tennessee—June 5, by State Dpt. Hys. & P. Wks., Nashville, grading, drainage structures, concrete surfacing 46,490 sq.yd. Federal Aid Project 80-E (Reopened), Wilson Co. R. H. Baker, hy. comr.

Virginia—June 9, by State Hy. Dpt., Richmond, improving roads Projects 221, 464, 657, 670, 677; adv. E. N.-R. May 28.

Washington—June 9, by S. J. Humes, dir. Hys., Olympia, concrete paving 7.9 mi. State Rd. 3, Grandview to Sunnyside, Emergency F. A. P. 132-H, Yakima Co. — stockpiling, crushed stone and bituminous treated surfacing 48,790 cu.yd. State Rd. 8, Washougal to Stevenson, Clark and Skamania Counties — crushed stone surfacing for seal coat oiling 24,600 cu.yd. State Rd. 3, Deer Park to Boyds, Spokane, Stevens and Ferry Counties—crushed graveling 31 mi. State Rd. 9, Discovery Bay to End of pavement east of Port Angeles.

Wash., Wenatchee—June 1, by Comrs. Chelan Co., grading, culverts, bridging, crushed stone surfacing 13,700 cu.yd. Permanent Hy. 6 and 25. B. B. Carter, Wenatchee, co. engr.

Wisconsin — June 2, by State Hy. Comn. and Hy. Com. Sauk Co., State Capitol Annex, Madison, grading, crushed graveling 3,034 cu.yd. Portage-Baraboo Rd., S. T. H. 33, F. A. P. 177; 1,739 cu.yd. Cashton-Reedsburg Rd., S. T. H. 33, F. A. P. 448-B, both Sauk Co.

Wisconsin—June 3, by State Hy. Comn. and Hy. Coms. Green Lake, Marathon and Portage Counties, Wisconsin Rapids, grading, concrete paving 50,108 sq.yd. Omro-Berlin Rd., S. T. H. 116, S. A. P. 4541, Green Lake-Berlin Rd., S. T. H. 49, S. A. P. 4542, and Berlin-Fairburn Rd., C. T. H. E and F, S. A. P. 4543, Green Lake Co.—33,894 sq.yd. Schofield Grade Crossing Impvt., U. S. Hy. 51 and S. T. H. 29, F. A. P. 94 and 441-D, Marathon Co.—bituminous surfacing 37,312 sq.yd. Spirit-Almond Rd., Co. Trunk Hys. A and J, C. A. P. 4644, Portage Co.

Wisconsin—June 4, by State Hy. Comn. and Hy. Comrs. Manitowoc, Oconto and Shawano Counties, Green Bay, concrete paving 69,669 sq.yd. Four Corners-Manitowoc Rd., U. S. Hys. 10 and 141, F. A. P. 424-D and E, Manitowoc Co. — 49,846 sq.yd. Kiel-South Co. Line Rd., S. T. H. 32, S. A. P. 3369, Manitowoc Co. — 386 sq.yd. approaches to Wittenberg Overhead, S. T. H. 29, F. A. P. 441-E, Shawano Co.—crushed graveling 6,067 cu.yd. South County Line-Gillett Rd., S. T. H. 32, S. A. P. 3239, Oconto Co. — 12.7 mi. Keshena-Pholx Rd., S. T. H. 47, S. A. P. 3267, Shawano Co.—30,579 cu.yd. Wolf River Bridge — grading 11.582 mi. Shawano-Neopit Rd., S. T. H. 47, F. A. P. 385-D—3.753 mi. Shawano-Tilleda Rd., S. T. H. 29, F. A. P. 57, 441-C and F, Shawano Co.

Ont., Hamilton—See "Contracts Awarded."

Ont., Napanee—See "Contracts Awarded."

Ont., Sarnia—Lambton Co., expending $134,725, maintenance of roads, incl. grading, graveling, repairs, to be done by day labor. New construction, new machinery ($5,000). G. M. McCubbin, Harrison Hall, Chatham, engr.

CONTRACTS AWARDED

Arizona—State Hy. Comn., Phoenix, grading Mesa Casa Grande Hy. and Florence Tucson Hy., to Skeels & Graham, Consolidated Bank Bldg., Tucson $127,916—grading, placing sub-grade stabilizer on Blythe-Wickenburg Hy., to Canion & Francis, 2012 West Van Buren St., Phoenix, $23,443—Blythe Wickensburg Hy., to V. R. Dennis Constr. Co., Box F, Sta. A, San Diego, Calif., $215,976. Grand total $367,335.

California — State Hy. Comn., Sacramento, grading, untreated crushed gravel or stone surfacing 1.7 mi. road in Eldorado Co., to Finnell Co., 1630 39th St., Sacramento, $52,594 — bituminous treated crushed gravel or stone surfacing 24.5 mi. Lassen and Modoc Counties, to Hemstreet & Bell, Marysville, $129,646—23.8 mi. Modoc Co., to Hartman Constr. Co., Box 1697, Bakersfield, $134,875—grading, drainage structures, concrete and asphaltic concrete surfacing 5.5 mi. Orange Co., to Jahn & Bressi, 208 West 8th St., Los Angeles, $282,107. Grand total $599,582. Noted Apr. 16.

Illinois—State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, concrete surfacing 5.36 mi. Perry and Jackson Counties, and 6 mi. Jackson Co., to J. Kesl & Sons, Edwardsville, $96,810 and $125,462 respectively—0.8 mi. Union Co., to B. McCoy, Equality, $24,544 — 8.03 mi. Jersey Co., to Henkel Constr. Co., Mason City, Ia., $124,186—7.48 mi. Richland and Edwards Counties, and 6.96 mi. Edwards Co., to W. Laugh & Sons, Marion, $93,073 and $27,123 respectively—grading, drainage structures 11.15 mi. Williamson and Jackson Counties, to R. B. Potashnick, Cape Girardeau, Mo., $81,697. Grand total $572,895. Noted Apr. 9.

Ill., Chicago—See "Bridges."

Kansas — State Hy. Comn., Court House, Stockton **(P. means Project, K.P. Kansas Project and F.A.P. Federal Aid Project)** to G. W. Condon, 223 Grain Exch. Bldg., Omaha, Neb., grading, drainage structures 4.448 mi. road in Graham Co. $17,649; 17.257 mi. Rooks Co. $140,553—to List & Clark, 3.011 mi. Dickinson Co. $21,905; 4.427 mi. Marion Co. $24,028—to D. H. Hardiman, Alton, grading, drainage structures, clay gravel surfacing 5.237 mi. P. 40N-13, F. A. P. 371-F, $6,064, 1.307 mi. P. 40N-13, K. P. 1147 $1,667, both Rooks Co.; 8.62 mi. Osborn Co. $7,481; 6.818 mi. Ellis Co. $9,145—to Koss Constr. Co., 2818 5th Ave., Des Moines, Ia., grading, drainage structures, concrefe surfacing Ellsworth Co. $12,214; 9.753 mi. Saline Co. $238,809—to Roberts Constr. Co., Bitting Bldg., Wichita, 2.031 mi. P. 81-12, F. A. P. 287-A $45,952; 2.981 mi. P. 81-12, F. A. P. 287-B, $66,830, both McPherson Co.—to Brasnaham Bros., 218 City Bank Bldg., Kansas City, Mo., 0.225 mi. Dickinson Co. $7,456; 0.86 mi. P. 408-20, F. A. P. 10-AB $30,567; 0.364 mi. P. 408-22, F. A. P. 12-A $16,877, both Geary Co. Grand total $647,797. Noted Mar. 5.

Massachusetts—Dpt. P. Wks., A. W. Dean, engr., State House, Boston, bituminous macadam paving 5,200 ft. Lynnfield, to State Constr. Co., 509 Main St., Saugus, $23,853—9,800 ft. Agawam, and 2,633 ft. Cheshire, to Lane Constr. Corp., 134 State St., Meriden, Conn., $39,142 and $13,787 respectively—4,150 ft. Westboro, to Carlo Bianchi & Co., Framingham, $24,037—7,720 ft. Easton, to Arute Bros., Inc., 513 South Main St., New Britain, Conn., $36,208. Grand total $137,027. Noted May 7.

Nebraska—State Hy. Dpt., Lincoln, to Abel Constr. Co., 308 Terminal Bldg., Lincoln, graveling 5.5 mi. Patrol 1102, Lancaster Co. $2,708; 15.9 mi. Patrols 108 and 109, Lancaster and Otoe Counties, $8,249; 13.1 mi. Patrols 132 and 33, Otoe Co. $6,423; 22.1 mi. Saunders and Butler Counties $11,144; 3.9 mi. Lancaster Co. $2,540; 19 mi. Madison and Boone Counties $8,033; 18.9 mi. Madison, Stanton and Cuming Counties, $6,400; 14.3 mi. Madison and Pierce Counties $6,141; 19.3 mi. Thurston and Dakota Counties $7,585; 19.4 mi. Dixon Co. $7,003; 29 mi. Valley and Greeley Counties $4,971; 6.7 mi. Howard Co. $2,303; 10 mi. Buffalo and Sherman Counties $3,647; 9 mi. Hall and Merrick Counties $1,685; 18.3 mi. Hall Co. $4,429; 8.2 mi. Holt and Boyd Counties $3,109—to Yant Constr. Co., 1146 Omaha Natl Bank Bldg., Omaha, 22.9 mi. Gage, Lancaster and Saline Counties $14,779; 15.9 mi. Sarpy Co. $5,649; 20.8 mi. Burt Co. $7,175—to H. A. Riske, Nebraska City, 32 mi. Cass Co. $10,437—to Allen Davidson Sand & Gravel Co., Beatrice, 16.5 mi. Johnson and Gage Counties $8,877—to Koehler Constr. Co., Sterling, 19.4 mi. Nemaha and Johnson Counties $12,325; 3.8 mi. Johnson Co. $6,780—to S. L. Sokol, Duncan, 15.2 mi. Polk and Butler Counties, $5,618; 17.9 mi. Cuming and Thurston Counties, $5,852; 6.9 mi. Hamilton and Polk Counties $1,900 — to Carstenson Sand & Gravel Co., Columbus, 5.9 mi. Platte Co. $3,019; 7.9 mi. Butler Co. $2,188; 17.7 mi. Madison and Antelope Counties $3,925—to Western Bridge & Constr. Co., 3867 Leavenworth St., Omaha, 25.3 mi. Dixon and Dakota Counties $20,572; 1.6 mi. Sheridan Co. $2,297; 1.6 mi. Cherry Co. $2,806—to Murphy Gravel Co., Fremont, 12.3 mi. Nance Co. $4,271; 9.1 mi. Dodge Co. $6,760—to E. W. Nichols, Fairmont, 22.6 mi. Hamilton Co. $10,163; 7 mi. Adams Co. $3,303; 4.2 mi. Clay Co. $1,439; 7.8 mi. Clay Co. $4,785; 12.1 mi. Nuckolls Co. $3,712—to Central Bridge & Constr. Co., Wahoo, 11.5 mi. Hall and Adams Counties $2,108—to P. C. Baker, Morrill, 36.9 mi. Adams and Webster Counties $9,052—to V. M. Haddon, Valley, 8.6 mi. Deuel Co. $2,500; 9 mi. Knox Co. $3,221 9.5 mi. Red Willow Co. $5,033—to Clark & Francisco, Scottsbluff, 8 mi. Kimball Co. $2,731—to Roberts Constr. Co., 404 1st Natl. Bank Bldg., Lincoln, 6.1 mi. Morrill Co. $2,872; 14.7 mi. Dawes Co. $11,912 3.9 mi. Holt Co. $1,538. Grand total $281,969.

New Jersey—Middletown Twp. Comn., Port Monmouth, H. W. Roberts, clk., concrete paving road from New Monmouth to Port Monmouth, to Riverside Concrete Co., Red Bank, $74,377. Noted Mar. 12, under "Middletown."

New Jersey—State Hy. Comn., Trenton, grading, curbing, bituminous concrete on concrete paving Union Co., to Standard Bitulithic Co., 50 Church St., New York, $50,962. Noted May 7.

N. J., Jersey City—Bd. City Comrs., City Hall, repairing asphalt pavements not under guarantee from date of contract to Dec. 31, and resurfacing intersections Bramhall Ave. and Grand St., Baldwin from Wayne to Academy Sts., Bowers St. from Palisade to Central Aves., to New Jersey Asphalt & Paving Co., Inc., foot Jersey Ave., Jersey City, $29,758.

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Streets and Roads (Continued)

N. J., Trenton—City Comn., penetration macadam paving 13,270 sq.yd. John Fitch Way, to J. Vinch, 1236 Princeton Ave., $22,724.

New York—A. W. Brandt, comr. hys. Albany, bituminous concrete paving 6.73 mi. Schoharie Co., to Mariani Constr. Co., New Haven, Conn., $237,179—5.8 mi. Erie Co., to Holmes & Murphy, Orchard Park, $230,969 est. $331,311—concrete paving 2.68 mi. Dutchess Co., to T. F. Foley, Inc., South Norwalk, Conn., $134,816 est. $199,982—2.05 mi. Fulton Co., to Lane Constr. Co., 37 Colony St., Meriden, Conn., $72,976 est. $101,663—5.3 mi. Jefferson Co., to Arborio Road Constr. Co., Inc., 525 Main St., Hartford, Conn., $182,841 est. $241,352—5.18 mi. Lewis Co., to A. F. McConville, Ogdensburg, $197,257 est. $265,488—3.44 mi. Schenectady Co., to Mailey Constr. Co., Schenectady, $110,321 est. $153,210—0.63 mi. Westchester Co., to Rye & Portchester Constr. Co., Portchester, $24,451 est. $41,407. Grand total $1,190,810. Noted Apr. 16 and 23.

N. Y., New Rochelle—Westchester Co., Court House, White Plains, grading, curbing, sidewalks, concrete paving 14,900 cu.yd. North Ave., to C. D. Beckwith, Inc., Tarrytown Rd., White Plains, $261,924. Noted Apr. 30.

Ohio—O. W. Merrell, dir. hys., Columbus, widening, waterbound macadam paving 3.92 mi. Ashland Co. and 5.13 mi. Richland Co., to Ohio Eng. Co., Lorain, $30,364 and $34,805 respectively—8.11 mi. Defiance Co., to C. A. Botkin & Son, 767 South 22nd St., Columbus, $71,823—7.72 mi. Defiance Co., to C. E. Edgington, Findlay, $60,936—2.49 mi. Hardin Co., to F. H. Bailey & Co., Kenton, $26,822—6.1 mi. Knox Co., to N. P. Putnam Co., 20 East Broad St., Columbus, $50,755—6.35 mi. Licking Co., to Federal Asphalt Paving Co., Hamilton, $66,436—8.982 mi. Portage Co. and 2.92 mi. Richland Co., to D. C. Ingold, McComb, $76,899 and $18,032 respectively—7.73 mi. Seneca Co., to Seneca Constr. Co., Fostoria, $42,139. Grand total $479,011. Noted May 14.

O., Cleveland—Cuyahoga Co., curbing, guttering, grading, 3 in. vitr. brick paving 36,600 sq.yd. Triskett Rd. 2, to Cleveland Trinidad Paving Co., Western Reserve Bldg., $157,343. Est. $237,300. Noted May 7.

Pennsylvania — State Hy. Dpt., Harrisburg, grading, drainage structures, concrete surfacing 9,600 sq.yd. roads in Northampton Co., to Graham Constr. Co., Lancaster, $26,162—54,772 sq.yd. York Co., to E. R. Mixner, Ocean City, N. J., $149,413—23,400 sq.yd. Sullivan Co., to G. Powell, Nanticoke, $47,019—51,172 sq.yd. Cameron Co., to Russell Bros., Youngstown, O., $144,584—78,000 sq.yd. Tioga Co. and 27,683 sq.yd. Center Co., incl. 31,317 sq.yd. miscellaneous material, to M. Bennett & Sons, Indiana, $183,110 and $144,245 respectively. Grand total $649,533. Noted Apr. 23.

Pennsylvania — State Hy. Dpt., Harrisburg, grading, drainage structures, waterbound macadam surfacing 112,113 sq.yd. Franklin and Perry Counties, to York Eng. & Constr. Co., York, $323,407. Noted Apr. 16.

Pennsylvania — State Hy. Dpt., Harrisburg, grading, drainage structures, concrete surfacing 43,323 sq.yd. roads in Chester Co., to Keystone Paving Co., Harrisburg, $143,902 — grading, drainage structures, waterbound macadam surfacing 55,513 sq.yd. Jefferson Co., to A. R. Cooper & Son, Idamar, $126,623—32,266 sq.yd. Wayne Co., to R. G. Lassiter & Co., Greensboro, N. C., $83,884—97,795 sq.yd. Lackawanna Co., to J. Booth, Inc., Carbondale, $309,505. Grand total $663,914. Noted Apr. 23.

West Virginia—State Roads Comn., Charleston, to Mirable & Defurion, Welch, improving roads on Project 102, Boone Co. $115,445—to Springer & Springer Constr. Co., Wheeling Project 2065, Ohio Co. $109,485—to Pochahontas Constr. Co., Cass, Project 3220, Preston Co. $85,921—to Gilbert Constr. Co., Glenhedrick, Project 2022 Raleigh Co. $71,447—to S. G. Palino, Fairmont, Project 3443, Randolph Co. $213,463—to S. Rich, Weston, Project 119, Ritchie Co. $11,180—to R. F. Kirkham Co., 1634 B Quarrie, Charleston, Project 3354-C, Raleigh Co. $56,419; Project 3134-B, Kanawha Co. $21,011—to Kelly Constr. Co., Clarksburg, Project 182-D $140,320; Project 183-B $178,211, both Pleasants Co.—to Southern Oil & Tar Co., Clay St. and River Rd., Louisville, Ky., Project 3076 $17,574; Route 5 $33,354, both Calhoun Co., Project 3326 $23,565, Project 3326 $4,929, Project 3311 $6,375 all Putnam Co. Grand total $1,088,699. To T. E. Walker, Huntington, wire rope guard rail, Project 174-A, Cabell Co., at $0.2499 per lin.ft. Noted May 14.

Canada — Dpt. P. Hys., Parliament Bldgs., Toronto, A. A. Smith, deputy minister, concrete paving 6.5 mi. Winchester, northerly, Contr. 31-31, to W. H. Harvey & Son, 56 Kensington Ave., Kingston, Ont. — 5 mi. Teviotdale to Palmerton, Contr. 31-32, to Highway Paving Co., Fleet and Bathurst Sts., Toronto, Ont.—grading, culvers 6.5 mi. Orangeville, westerly, Contr. 31-37, to W. A. Mackey, 469 Willard Ave., Toronto, Ont.—1 mi. Marmora, westerly, Contr. 31-38, to McNamara Constr. Co., 53 Yonge St., Toronto, Ont. — concrete bridges Munesing and Nottawasaga, to Holdcroft Constr. Co., 320 Alfred St., Kingston, Ont.—concrete bridge Big Creek, near Tilbury, Contr. 31-42, to Colantti Bros., 612 Langlois St. Windsor, Ont.—concrete bridge at Warwick, Contr. 31-43, to Canada Paving & Supply Corp., East Windsor, Ont. Est. $350,000. Noted Apr. 24 Daily.

Ont., Hamilton—Wentworth Co., H. A. Lumsden, engr., County Bldg., maintenance, incl. grading, ditching, drainage structures, day labor. New construction by contract, $67,854 to be expended this season for same.

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Ont., Napanee—Lennox and Addington Counties, T. V. Anderson, Napanee, engr., road maintenance, incl. grading, graveling, drainage structures, culverts, etc., day labor. $35,000 to be expended this year for same.

Ont., Sarnia—See "Bids Asked."

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Tex., Brownsville—Cameron Co. Water Impvt. Dist. 14, c/o S. K. Hallam, Arcade Bldg., Port Isabel, soon takes new bids complete irrigation system for 15,000 acre tract, incl. concrete lined canals, underground system, at Port Isabel. $1,500,000. Former bids rejected. W. E. Anderson, Hollingsworth Bldg., San Benito, engr. Noted Apr. 9.

Tex., Raymondville—Willacy Co. Water Control Dist. 1 plans approved by State Bd. Water Engineers for irrigation project incl. irrigating 129,000 acre tract, constructing storage reservoir holding 75,000 acre ft. water, pump plant, 27 mi. main canal from pumping plant to reservoir, 14 main canals from reservoir to section of district and 560 mi. concrete lined canals and pipes. $7,500,000. Morgan Eng. Co., Harlingen, engrs.

BIDS ASKED

New Jersey—June 15, at office Bd. Commerce & Navigation, State House, Trenton, dredging channel beginning in Pecks Bay and extending in southerly direction through Pecks Bay, Crook Horn Thoroughfare, Main Thoroughfare, and Ben Hand Thoroughfare to Upper Thoroughfare, Cape May Co., Contr. 53. V. Gelineau, dir. and ch. engr.; adv. E. N.-R. May 28.

CONTRACTS AWARDED

Ont., Toronto — Toronto General Burying Grounds, 1643 Yonge St., removing 70,000 cu.yd. earth from Pinehill Cemetery, Kennedy Rd., to J. Martello, 16 Strathearn Blvd. Est. $30,000.

Bond Elections

Coming Bond Elections

Water Tank and Tower—Brawley, Calif., $20,000. Burns McDonnell-Smith Eng. Co., Los Angeles, Engr.

Gas System—Higginville, Mo., June 2, $55,000. J. W. Shikles Eng. Co., Kansas City, Engr.

School—Grand Forks, N. D., May 28, $200,000. Wells & Ellis, Grand Forks, Engr.

Bonds Voted

Waterworks Impvts—Gunnison, Utah, $30,000.

Bonds Defeated

Sewers—Oakland, Calif., $1,300,000.
Park Development—Oakland, Calif., $275,000.
Municipal Exposition Building—Oakland, Calif., $375,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Ala., Athens—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office. $90,000 appropriated.

Conn., New Haven—DREDGING—U. S. Eng., Providence, R. I., 150,000 cu.yd. from Bowery St. Channel. To exceed $25,000.

Miss., Meridian—POST OFFICE—Treas. Dpt. at office Sup. Archt. plans by P. J. Krouse, 505 M. & W. Bldg., and F. A. Fort, 1309 24th Ave., assoc. archts., U. S. Post Office, 9th, 10th, 21st and 22nd Sts. $550,000. J. W. Wetmore, acting superv. archt. Noted Jan. 15.

Utah, Fort Douglas—LIGHTING SYSTEM—Con. Q. M., preliminary plans lighting system at Fort Douglas Reservation. $15,000.

Va., Langley Field — WAREHOUSES — Con. Q. M., rejected bids Apr. 30, air corps warehouses at Langley Field. Noted Apr. 2.

Tex., Legion — GARAGE, etc. — Vet. Bu., Arlington Bldg., 1 story, 60 x 160 ft. garage and work shop, at U. S. Veterans' Hospital. $60,000.

T. H., Honolulu — WATER SOFTENER PLANT—Con. Q. M., Fort Mason, San Francisco, 75,000 gal. water softener plant.

BIDS ASKED

Arizona — BRIDGE — June 2, by C. H. Sweetser, dist. engr., Pub. Rds., Ellis Bldg., Phoenix, Rio Puerco and Dry Creek Bridge in Apache Co.

Arizona — ROADS — June 2, by C. D. Sweetser, dist. engr. Pub. Rds., Ellis Bldg., Phoenix, grading 16.32 mi. Petrified Natl. Forest Monument Hy., Apache and Navajo Counties.

California—ROAD—June 4, by C. H. Sweetser, dist. engr. Pub. Rds., 461 Market St., San Francisco, oiling 11.081 mi. Sects. A and B, Route 73, Laguna Natl. Forest Hy., San Diego Co.

Calif., San Francisco—ROCK REMOVAL—July 9, by U. S. Eng., Custom House, 40,000 cu.yd. rock removal in San Francisco Bay. $200,000 available. Total est. $500,000. Noted Apr. 30.

Illinois — LOCK GATE, etc. — June 15, by U. S. Eng., 1st Chicago Dist., 333 North Michigan Ave., Chicago, installing lock gate and lock valve operating machinery, at Brandon Rd. and Dresden Island Locks, on Illinois Waterway.

Ky., Louisville—POST OFFICE—June 22, by Treas. Dpt. at office Sup. Archt., U. S. Post Office. $2,985,000. Noted Apr. 30.

Mass., Lynn—DREDGING—June 11, by U. S. Eng., Customhouse, Boston, in Lynn Harbor; adv. E. N.-R. May 28. Noted Apr. 30.

N. Y., Elmira—PASSENGER ELEVATOR—June 12, by Treas. Dpt. at office Sup. Archt., passenger elevator in U. S. Post Office and Court House.

Pa., Erie — POST OFFICE — June 17, by Treas. Dpt. at office Sup. Archt., U. S. Post Office; adv. E. N.-R. May 28. Noted Dec. 25.

S. C., Rock Hill—ELEVATORS—June 3, by Treas. Dpt. at office Sup. Archt., elevators.

Tennessee and Georgia—ROAD—June 12, at office Con. Q. M., James Bldg., Chattanooga, Tenn., rebuilding, resurfacing Missionary Ridge Crest Rd.; adv. E. N.-R. May 28.

Tex., Houston—POST OFFICE—June 16, by Treas. Dpt. at office Sup. Archt., extending, remodeling (except elevators) U. S. Post Office and Court House.

Utah—ROADS—June 1, by Natl. Park Serv., Dpt. Interior, Ogden, grading, surfacing Floor of Valley Rd., constructing bridge path, Zion Natl. Park, Project 2-B, Zion Natl. Park, Washington Co.; grading, crushed rock or gravel surfacing 20,500 cu.yd. Rim Rd., Bryce Canyon Natl. Park Project 1-A, Garfield Co. B. J. Finch, dist. engr.

Utah, Salt Lake City—ELEVATORS—June 8, by Treas. Dpt. at office Sup. Archt., elevators.

Va., Quantico—PUMP HOUSE, etc.—June 3, by Yards & Docks, Navy Dpt., concrete and brick pump houses, concrete pump pit, booster pump, and piping; also wire guards for windows and doors at Marine Barracks.

Va., Quantico—PAVING—Spec. 6535—June 10, by Yards & Docks, Navy Dpt., concrete paving and vitr. pipe drain lines at Marine Barracks (Flying Field).

Alaska, Chilkoot Barracks — DIESEL ENGINES—June 1, by Con. Q.M., three 75 hp. diesel engines, direct connected to A.C. generators, 3 phase, 2300 volt, 60 cycle, automatic generator voltage regular, complete switchboard, accessories, spare parts, etc., furnishing and installing 2 oil storage tanks.

Alaska, Petersburg—DREDGING—See "Contracts Awarded."

T. H., Fort Armstrong—WATER SOFTENER PLANT—June 4, by Con. Q. M., green sand zeolite water softener.

CONTRACTS AWARDED

Ala., Montgomery—HOSPITAL—Con. Q. M., Maxwell Field, detachment barracks, to Samford Bros., 301 Washington St., $137,866. Noted Mar. 26.

Ala., Tuscaloosa — PLUMBING, etc. — Vet. Bu., Arlington Bldg., plumbing, electrical work and heating in hospital, to Bryce Plumbing & Heating Co., Florence, S. C., $232,477. Noted Apr. 21.

Arizona—ROAD—Pub. Rds., San Francisco, Calif., grading 12.975 mi. Coconino Co., to O. A. Lindberg, Stockton, Calif., $42,525. Est. $48,336. Noted Apr. 30.

California—BRIDGE—C. H. Sweetser, dist. engr., Pub. Rds., 461 Market St., San Francisco, rein.-con., steel bridges over south fork of Merced River, Yosemite Nat. Park, and over Big Creek, Oakhurst Hy., Mariposa Co., to G. Pollock Co., Forum Bldg., Sacramento, $46,457. Noted Apr. 9.

Calif., Oakland—POST OFFICE—Treas. Dpt. at office Sup. Archt., superstructure U. S. Post Office, to K. E. Parker Co., 135 South Park Ave., San Francisco, $545,200. Noted Apr. 9.

Calif., San Diego—MESS HALL—Yards & Docks, Navy Dpt., mess hall at Naval Operating Base, to M. H. Golden, Calif. Bank Bldg., $264,692. Noted May 21.

Fla., Lake City—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to Williams Constr. Co., Red Rock Bldg., Atlanta, Ga., $105,895. Noted Apr. 23.

Ill., Kankakee — REMODELING and ENLARGING—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to Ortman & Dreher, 633 Union Interstate Bldg., Flint, Mich., $19,063. Noted Apr. 30.

Louisiana—LEVEE—U. S. Eng., New Orleans, to J. H. Boyce Sons Co. and R. L. Igo, Memphis, Tenn., 1,520,000 cu.yd. enlargement in Picayune-ville Levee, $179,816; to Lower Coast Constr. Co. and Hy. Constr. Co., Inc., Godchaux Bldg., New Orleans, 100,000 cu.yd. in Story Levee, $11,000, 50,000 cu.yd. in Pecan Grove Levee $5,500, 30,000 cu.yd. in Colletee Levee $3,300, 175,000 cu.yd. Waguespack Levee $19,250; all foregoing in Lafurche Levee Dist.; to Valley Constr. Co., Newellton, 665,000 cu.yd. Elkridge-White Oak Levee Enlargement, Lower Tensas Levee Dist. $102,277. Grand total $321,143. Noted Apr. 2.

Mass., Boston — GENERATOR — Yards & Docks, Navy Dpt. at office Sup. Archt., motor generator sets and switchboard at Navy Yard, to F. A. Mazzur Co., Inc., 141 Milk St., $60,000. Noted Mar. 16 Daily.

Mass., Chelsea—REFRIGERATION and ICE PLANT—Yards & Docks, Navy Dpt., refrigerating and ice making plant, to Vilter Mfg. Co., 2217 South 1st St., Milwaukee, $11,185. Noted Apr. 23.

Minn., Hastings—DREDGING—U. S. Eng., 155,000 cu.yd. in Mississippi River, to Twin City Barge & Gravel Co., 817 Hennepin Ave., Minneapolis, $0.159 per cu.yd. Noted Mar. 19.

Missouri—PILING DIKES—U. S. Eng. Custom House, St. Louis, 1,500 ft. piling dikes in Missouri River at Dozier and Centaur Bends, to Woods Bros. Constr. Co., 132 South 13th St., Lincoln, Neb., $45,203. Noted May 14.

N. Y., Governors Island (br. New York) — BARRACKS—Con. Q. M., 39 Whitehall St., New York, detachment barracks at Fort Jay, to Neinken-Mertz Constr. Co., 166 Montague St., Brooklyn, $221,847. Noted Apr. 2.

O., Hamilton—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to J.

Federal Government Work (Continued)

Largura & Co., Gary, Ind., $173,800. Noted Apr. 27.

Oregon—ROADS—Pub. Rds., Portland, improving 59.05 mi. Crater Lake Hy., Crater Lake Natl. Park, 16-18 ft., Klamath Co., to P. L. Crooks & Co., Henry Bldg., Portland, $247,055; 14.897 mi. road in Crater Lake Natl. Park, 16 and 18 ft., Klamath Co., to McNutt & Pyle, Eugene, $60,914.

Pa., Phila. — REROOFING, etc. — Yards & Docks, Navy Dpt., reroofing storehouses and buildings at Navy Yard, to General Eng. Corp. of Pennsylvania, Upper Darby, $25,500.

R. I., Newport—POWER PLANT—Yards & Docks, Navy Dpt., central power plant, at Naval Training Station, to Coleman Constr. Co., 86 Weybosset St., Providence, $12,659 plus $170. Noted May 7.

Tex., Coleman—POST OFFICE—Treas. Dpt. at office Sup. Archt., constructing U. S. Post Office, to Christy-Dolph Constr. Co., Industrial Bldg., Dallas, $69,800. Noted Apr. 23.

Tex., Sweetwater — POST OFFICE — Treas. Dpt. at office Sup. Archt., U. S. Post Office, to Christy-Dolph Constr. Co., Industrial Bldg., Dallas, $78,800. Noted Apr. 23.

Va., Fort Humphrey—HOSPITAL—Con. Q. M., hospital, to Jewell-Riddle Co., Sanford, N. C., $107,625. Noted Apr. 2.

Va., Norfolk—BUILDING—Yards & Docks, Navy Dpt., building on pier, Navy Yard, to Logan McCloud, Norfolk, $4,975.

Wyoming—ROAD—Pub. Rds., 301 Custom House, Denver, Colo., grading 15.932 mi. East Entrance Natl. Park Hy., Yellowstone Natl. Park, to Stevens Bros., 612 Endicott Bldg., St. Paul, Minn., $88,627 est. $77,800; 24 mi. Grand Loup Natl. Park Hy., Yellowstone Natl. Park, to C. V. Hallenbeck Constr. Co., Portland, Colo., $294,542 est. $315,896. Noted Apr. 23.

Alaska, Petersburg — DREDGING — U. S. Eng., Burke Bldg., Seattle, Wash., dredging Shoal 2, Petersburg Bar, Wrangell Narrows, own forces. $35,000. Former bids rejected.

RAILWAYS

BIDS ASKED

Nevada—Six Companies, Inc., Boulder City, taking bids 16 mi. railroad at Hoover Dam site, Boulder City. F. T. Crowe, supt. constr. Boulder City.

SUBWAYS AND TUNNELS

CONTRACTS AWARDED

N. Y., Long Island City—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, installing tracks and contract rail for Rapid Transit R.R., under Steinway St., to B.T. and J. J. Mack, 160 Bway., $247,120. Noted Apr. 30.

GRADE CROSSINGS

CONTRACTS AWARDED

Mich., Detroit—Wayne Co. Road Comn., excavating, grading, paving, sodding for grade separation to carry hy. beneath Wabash R.R., at Allen Rd., to Bradle Constr. Co., 810 Fox Theatre Bldg., $67,000.

N. Y., Cobleskill—Delaware & Hudson R.R. Co., J. MacMartin, ch. engr., Albany, eliminating West Main St., Ryder and Washington Ave. Grade Crossings, to Bates & Rogers Constr. Co., 75 West St., New York, $135,640. Est. $228,854. Noted Apr. 23.

N. Y., Syracuse—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, eliminating Gouverneur Street Crossing on Canton-DeKalb State Hy., Lawrence Co., to Walsh Constr. Co., Herald Bldg., Syracuse, $57,937. Est. $73,270.

N. Y., Brooklyn—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, Linden Blvd. Undercrossing at Livonia Avenue Yard, to Knidem Constr. Co., 4197 Park Ave., $268,000. Noted Mar. 26.

O., Canton—Pennsylvania R.R., W. D. Wiggins, ch. engr. (Central Region), Pennsylvania Station, Pittsburgh, Pa., grade crossing elimination, Harrison Ave., to Crossan Constr. Co., Brownsville, Pa., $100,000.

O., Centerburg—Pennsylvania R.R., W. D. Wiggins, ch. engr. (Central Region), Pennsylvania Sta., Pittsburgh, Pa., railroad crossing elimination, to W. M. Brode Co., Newcomerstown, $90,000.

DAMS

PROPOSED WORK

Calif., Oceanside—See "Waterworks."

CONTRACTS AWARDED

Mass., Leominster—See "Waterworks."

PIERS AND WHARVES

PROPOSED WORK

N. J., Brielle—PIERS—H. F. Hoffman, preliminary plans 100 ft. and 150 ft. piers, and 320 ft. timber bulkhead, on Manasquan River. $25,000 or more.

CONTRACTS AWARDED

N. Y., New York—Dpt. Docks, Pier "A" Battery Pl., reconstructing pier foot East 95th St., East River, Contr. 2034, to General Contg. & Eng. Co., 40 Rector St., $28,156.

AIRPORTS

PROPOSED WORK

Tex., Mineral Wells—Easterwood Fields, c/o Baker Hotels, hangar at Easterwood Fields. $75,000.

CONTRACTS AWARDED

Mass., Norwood, Dedham and Canton—Massachusetts Air Terminal and Arena, H. W. Plimpton, treas., hangars at airport, Fisher Meadows off Neponset St., to Truscon Steel Co., 260 Tremont St., Boston. Est. exceeds $25,000. Noted Jan. 22.

N. Y., Buffalo—G. Fisk, comr. P. Wks., retaining wall, ramp and loading carpet for Marine Airport, to D. W. Brown Co., 3000 Delaware Ave., Kenmore, $117,444. Noted Jan. 29.

GRAIN ELEVATORS

PROPOSED WORK

Mass., Roslindale (sta. Boston)—GRAIN ELEVATOR—Whittemore Grain Co., R. S. McSorley, in charge, Roslindale, grain elevator, Harrison St. Est. $25,000. Private plans.

CONTRACTS AWARDED

Ia., Council Bluffs — GRAIN ELEVATOR — Nye-Jenks Grain Co., 320 Grain Exch. Bldg., Omaha, Neb., 350,000 bu. grain elevator, rein. con. to Burrell Eng. & Constr. Co., 1 North Canal St., Chicago, Ill.

Mo., St. Louis — GRAIN ELEVATOR — St. Louis Merchants Bridge R.R. Co. (owner of ground), and Ralston Purina Co. (owner of building), 835 South 8th St., 50 x 112 ft. grain elevator, 808 Gratiot St., to Jones-Hettelsater Constr. Co., 600 Mutual Bldg., Kansas City. Est. $250,000.

POWER AND LIGHTING

PROPOSED WORK

Minn., Little Falls—Texota Service Co., 621 Banniff Bldg., Oklahoma City, Okla., granted franchise and plans gas distribution system. $150,000.

Tex., Amarillo—City, c/o W. M. Durham, mgr., rejected bids complete gas distribution system. $1,000,000. Project abandoned. E. N. Stanley, Amarillo, engr. Noted Mar. 26.

CONTRACTS AWARDED

New York—Westchester Co. Park Comn., 72 West Pondfield Rd., Bronxville, electric lighting on Cross Co. Parkway from Yonkers to Hutchinson River Parkway, Eastchester, to Reliance Electric Co., 450 Bedford Rd., Pleasantville, $22,319. Noted Apr. 30.

N. Y., New York—A. Goldman, comr. Plant & Structures, Municipal Bldg., lighting system and lamp posts on Manhattan Bridge, to Pyramid Electric Contg. Co., 228 East 41st St., $59,300. Noted Apr. 30.

PARKS AND SPORTS

PROPOSED WORK

Calif., San Diego—See "Schools."

Mass., Bedford—Town, Bd. Selectmen, preliminary plans by Smith & Walker, 80 Boylston St., Boston, recreation park, Page-Lane Field, incl. baseball diamond, gridiron with bleachers, locker building, cinder track. To exceed $25,000.

Mass., Boston—City, Park Dpt., 33 Beacon St., locker building, C St. and Broadway, South Boston, $25,000; also at American Legion Playground, South Boston, $25,000. Engineer not selected.

N. J., Clifton—Bd. City Council, City Hall, will not build concrete wading pool in Nash Pond Park, $25,000. Project abandoned. J. L. Fitzgerald, city engr. Noted Apr. 23.

N. Y., Brooklyn—Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, New York, selected C. D. Lay, landscape archt., to plan and supervise Marine Park Impvt. $40,000,000. Noted May 14.

N. Y., Rosebank (mail Staten Island)—Bd. Educ., 500 Park Ave., New York, soon takes bids municipal playground incl. grading, paving, retaining walls, fence, at P. S. 13, Anderson St., Hylan Blvd. and Clifton Ave. $27,000. W. C. Martin, Flatbush Ave. extension and Concord St., Brooklyn, archt.

Okla., Okmulgee — Okmulgee Country Club preliminary plans swimming pool. $25,000. Private plans. W. C. McAdoo, secy.

Tex., Amarillo—City, c/o W. N. Durham, mgr., 45 x 105 ft. rein.-con., brick, stucco swimming pool, concrete base, 2 to 10 ft. deep. E. N. Stanley, city engr. Owner may build by day labor.

BIDS ASKED

Calif., Pomona—Bd. Supervs., Los Angeles Co. taking bids 420 ft. steel, concrete grandstand, 143 ft. wide, 79 ft. deep, County Fair Grounds. $225,000. K. Muck, Hall of Records Bldg., co. archt.

Mass., Marblehead — Town, F. R. Doliber, taking bids 1 story, concrete, timber pavilion at Seaside Park. $25,000 or more.

CONTRACTS AWARDED

Ill., Chicago—Holabird & Root, archts., 333 North Michigan Ave., general contract, 1 story, 156 x 354 ft., limestone fieldhouse and will partly inclose 160 x 300 ft. dirt arena, for University of Chicago, 122 South Michigan Ave., to Otto Randolph, Inc., 53 West Jackson Blvd. Noted Apr. 22.

Ill., Jacksonville—State of Illinois, Capitol Bldg., Springfield, H. Hammond, superv., general contract brick, concrete swimming pool, bath house, at Illinois State School for Deaf, to Buerkin & Buerkin, Inc., Quincy, $22,875; heating, plumbing, ventilating, to Warwick Plumbing Co., Jacksonville $11,233; electric wiring, to G. A. Sieber, Jacksonville, $3,433; sanitary sewerage system, to J. Dennison, Alton, $5,387. Grand total $42,928. Noted Jan. 8.

HEATING AND VENTILATING

PROPOSED WORK

N. H., Franklin—S. Kurson, 60 Norfolk St., Bangor, Me., and Bunker & Savage, archts., 256 Water St., Augusta, Me., soon lets contract heating, plumbing and electrical work in theatre, store, and office, Central St. $25,000. Noted Apr. 30, under "Theatres."

N. Y., New York—J. Rothstein, 1133 Bway., plans by A. J. Simberg, 1133 Bway., altering boiler room and plumbing for 5 story store and apartment, 159 East 60th St. $40,000.

BIDS ASKED

Calif., San Francisco—June 2, by Bd. Trustees San Francisco War Memorial, plumbing, heating, ventilating equipment for American Legion Building and Opera House, Civic Center, for City and San Francisco Co. Total cost of buildings $5,000,000. Noted May 14 under "Buildings—Unclassified."

N. Y., New York—June 2, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, heating, ventilating, plumbing drainage, electrical work and fixtures in P. S. 76, Adee Ave. from Radcliffe to Bronxwood Aves.; also for P. S. 106, St. Raymond Ave. from Odell St. to Olmstead Ave., for Bd. Educ., 500 Park Ave.

CONTRACTS AWARDED

Ind., Kentland—City Council, steam heating plant, equipment, to Medland Bros., Logansport. Est. $25,000.

Ind., Wabash—Eagle Lodge, 2 story, basement, 44 x 65 ft. steam heating plant, equipment, to F. Webb, 242 West Market St. Est. $25,000.

UNCLASSIFIED

PROPOSED WORK

Ind., Shepardsville—COAL TIPPLE—Miami Coal Co., rebuilding coal tipple, incl. machinery, equipment. $85,000. Private plans.

Ia., Des Moines—BUS STATION—Interstate Transit Lines, 422 Grand St., sketches by R. E. Sawyer, 601 Flynn Bldg., part 1 and 2 story, covering 4 block, 4th St. and Court Ave. $40,000.

Minn., Minneapolis — TERMINAL — Great Lakes Pipe Line Co., H. Moreland, vice pres. and genl. mgr., Ponca City, Okla., terminal for gasoline pipe line from Kansas City, Mo., incl. field office and blending plant, steel tanks, at junction Northern Pacific Ry. tracks and Minnesota Transfer Ry. Co., near here. Ramsey Co.

N. Y., New York—MILK LOADING PLATFORM—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., 1 story, 13 x 351 ft. milk loading platform, West End Ave., from 64th to 65th Sts., to exceed $10,000; 1 story, 13 x 327 ft. auto loading platform, West End Ave., from 63rd to 64th Sts., to exceed $20,000; 13 x 399 ft. platform West End Ave. and 62nd St., $12,00.

Okla., Tishomingo—FISH HATCHERY—State Bd. Affairs, Capitol Bldg., Oklahoma City, preliminary plans fish hatchery for Pennington Creek, near here. $40,000. Private plans.

Texas — OIL PIPE LINE — Shamrock Pipe Line Co., Amarillo Bldg., Amarillo, subsidiary Shamrock Oil & Gas Co., Amarillo Bldg., Amarillo, and 2301 Clark Bldg., Pittsburgh, Pa., preliminary plans 10 in. oil pipe line from Arp through Kilgore to Longview and Gulf of Mexico, 40,000 bbl. daily capacity. $5,000,000. Private plans.

Texas—OIL PIPE LINE—Simms Petroleum Co., Magnolia Bldg., Dallas and Marshall, 125 mi. 8 in. oil pipe line from field in East Texas and run to refinery plant near Dallas. $800,000. Private plans.

Texas—OIL PIPE LINE—Sun Pipe Line Co., Beaumont, 200 mi. 10 in. c.i. bell joint oil pipe line starting from Tidewater at Beaumont, extending through Sour Lake to northern edge East Texas fields, incl. laterals, tapping several fields along route. $3,500,000. Private plans. Noted May 21.

Texas and Oklahoma — GAS PIPE LINE — Panhandle Light & Power Co., c/o C. R. Stahl, mgr., Borger, soon lets contract 74 mi. 10 in. natural gas pipe line from Dumas, Tex. to Boise City, Okla., also serving Stratford where company has franchise and from there to city limits of Boise City, Okla. $250,000. Cimarron Utilities Co., Box 127, Guyon, Tex., subsidiary will have charge of distribution.

Tex., Marble Falls — FISH HATCHERY — State Game Dpt., surveys fish hatchery, near large dam (now under construction). $40,000.

BIDS ASKED

N. Y., Batavia — TUNNELS — June 4, by Superintendent Dpt. Standards & Purchase, Capitol, Albany, construction, heating work for service tunnels, New York State School for Blind.

N. Y., New York—FINISH—June 2, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., providing and installing finish for underground rectifier stations, Route 106, Sects. 1, 3, 5, 6 and 7, Group V.

N. Y., New York—TURNSTILE EQUIPMENT —June 5, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., furnishing, installing turnstile equipment for 28 stations of line ex-

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Unclassified (Continued)

tending from Chambers Street Station to 207th Street Station, portion Independent System City-Owned Rapid Transit Railroads.

Tex., Riogrande—See "Contracts Awarded."

CONTRACTS AWARDED

Mass., Worcester — COMFORT STATION — City, Parks & Recreation Comn., brick, concrete comfort station, Holmes Field, to A. N. Booth, 394 May St. Est. $25,000.

N. Y., New York—SHED—A. Goldman, comr. Plant & Structures, Municipal Bldg., shed over Slip 3, Whitehall Ferry Terminal, to Court Constr. Co., 2 Lafayette St., $47,945. Noted Apr. 16.

Tex., Riogrande — GAS PIPE LINE — Rio Grande Pub. Serv. Co., c/o F. A. Hornaday, Riogrande, 8 mi. gas pipe line from Los Olmos Oil and Gas Co. well to here, own forces. $50,000. Private plans.

Wyoming and Nebraska—PIPE LINE—North Central Gas Co., c/o New York Oil Co., 39 Bway., New York, steel pipe for portion proposed pipe line from Big Muddy Field, Wyo. via Casper to Nebraska, to Republic Steel Co., 60 East 42nd St., New York. Noted Feb. 26.

MATERIALS

BIDS ASKED

SEWER and WATERPIPE—**Coalinga, Calif.**—City Council taking bids 1,600 ft. 6 in. sewer pipe and Y branches, 2,000 ft. 3 in. lap welded steel pipe, 2,000 ft. 1 in. galvanized water pipe.

ASPHALTS, ROAD OILS and TAR—**Indiana**—June 8, at office State Hy. Comn., Statehouse Annex, Indianapolis, various quantities, grades asphalts, road oils, tar shipped in tank cars, in barrels, various points of state, also small quantities applied to road surface at isolated points. J. J. Brown, dir.

CALCIUM CHLORIDE—**Indiana**—State Hy. Comn., Indianapolis, taking new bids 3,000 tons calcium chloride. $79,500. Former bids rejected. J. J. Brown, hy. engr.

ROAD OIL, etc.—**Indiana**—See "Streets and Roads."

CEMENT—**Trenton, N. J.**—June 9, by C. N. Leathem, archt., Trenton, 900 bbl. cement at Annandale for Dpt. Institutions & Agencies, Trenton.

CONCRETE—**Long Island City, N. Y.**—June 1, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., 300 cu.yd. ready mixed concrete.

PAVING BRICK—**North Braddock, Pa.**—June 2, by R. A. Noll, supt. P. Wks., 144,000 vitr. hillside block paving brick, 3½ x 4 x 8½, 673 cu.yd. concrete, 2,525 lin.ft. curb bar.

CONTRACTS AWARDED

CABLE—**Los Angeles, Calif.**—Bd. P. Wks., City Hall, 21,000 ft. 3-conductor, 500,000 c.m. sector strand insulated cable under Spec. 2409, to General Cable Corp., 939 East 4th St., $32,529.

CEMENT — **Los Angeles** — Bd. Supervs. Los Angeles Co., 1,300 bbl. portland cement f.o.b. cars siding Pomona, for culvert work on Fulton Rd., to Southwestern Portland Cement Co., 1719 Industrial St., at $2.40 per bbl. Noted May 7.

ROAD OIL—**Hartford, Conn.**—Bd. Contr. & Supply, at Mayor's Office, Municipal Bldg., 250,000 gal. more or less road oil with 45 to 55% asphaltic base, to Alden Speare's Sons Co., 156 6th St., Cambridge, Mass., $11,125. Noted May 7.

SULPHATE OF ALUMINA—**Detroit, Mich.**—Dpt. Water Supply, 735 Randolph St., 5,500 tons unpurified sulphate of alumina, f.o.b. cars Detroit, to General Chemical Co., 40 Rector St., New York, at $18.95 per ton in bags, $17.95 in bulk, total $104,225.

ASPHALTIC MACADAM BINDER, etc. — **St. George, N. Y.** — J. A. Lynch, pres. Richmond Boro, Boro Hall, to Vanbro Constr. Co., 24 Elizabeth 165,000 gal. asphaltic macadam binder, $9,042, 21,000 cu.yd. cinders $20,370, 2,600 cu.yd. sand $4,524; to J. Johnson Sons, 455 Bway., West New Brighton, broken stone, $3,680. Grand total $37,616. Noted May 7.

WATER METERS — **Toronto, Ont.** — York Twp., 3,000 water meters, ⅝ in. diam., to Neptune Meter Co., 345 Sorauren Ave. Est. $30,000.

EQUIPMENT

PROPOSED WORK

GRADER—**Two Harbors, Minn.**—Lake Co., P. W. Nelson, aud., purchasing motor patrol grader, H. C. Hanson, Two Harbors, co. hy. engr.

DREDGE—**Salt Lake City, Utah**—Associated Canals, H. Jessen, chn. and city engr., purchasing dredge, $12,000.

BIDS ASKED

AIR COMPRESSOR—**Pasadena, Calif.**—June 5, by B. Chamberlain, city clk., rotary air compressor for sewage disposal plant near Alhambra.

TRACTORS—**Aitkin, Minn.**—June 2, by C. V. Cline, aud. Aitkin Co., one or more 15-30 hp. crawler type tractors. A. A. McPherson, Aitkin, co. hy. engr.

GRADER—**Minneapolis, Minn.**—June 2, by F. S. Gram, city purch. agt., City Hall, 1 motor patrol grader. A. E. Berthe, park engr.

TRACTOR—**Winona, Minn.**—June 2, by A. Baeuerlen, aud. Winona Co., 1 wheel tractor dump, 4 yd. capacity. E. P. Effertz, Winona, co. hy. engr.

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METALS and CASTINGS, etc.—**New York, N. Y.**—June 1, by Dpt. Purchase, P. J. Dooling, comr. Purchase, Municipal Bldg., metals and castings to Dpt. Correction, Plant & Structures, and Water Supply, Gas & Electricity; also playground equipment to Dpt. Parks, Brooklyn.

NEW ROAD MACHINERY—**Sarnia, Ont.**—See "Streets and Roads."

GENERATOR SET—**Lachine, Que.**—June 8, by H. Daoust, city clk., 1 diesel engine driven generator set. Crepeau & Hunter, 1112 Dominion Sq. Bldg., Montreal, engrs.

FOREIGN

Australia, Sydney — July 8, by New South Wales Government Railways, one 2,500 kw. alternator.

Australia, Sydney — July 22, by New South Wales Government Railways, 1 jet condensing plant for Lithgow Power Station.

Bermuda, Hamilton — Princess Hotel Corp., (2nd unit), 6 story, 61 x 168 ft. hotel unit, to John W. Ferguson, 420 Lexington Ave., New York.

Mexico—S. Robertson, et al, Brownsville, Tex., plans standard gage railroad from Matamoros to Victoria. $10,000,000.

Rumania—Rumanian Government, Bucharest, concrete and asphalt roads, to A. Johnson & Co., Post Box 7171 Stockholm 7, Sweden. To exceed $1,000,000. A. Dahlberg, c/o A. Johnson & Co., 64 Water St., New York, or Stockholm, Sweden, taking bids now on road equipment.

Union Socialist Soviet Republics—Soviet Govt. c/o Amtorg Trading Co., 261 5th Ave., New York, meat packing plants at Moscow and Semipalatinsk Kazarkstan by technical aid contracts, $16,000,000. Owner now making contracts on equipment. Plans also other plants at various locations.

U. S. S. R., Tiflis—Soviet Govt. c/o Amtorg Trading Corp., 261 5th Ave., New York, shoe factory, here, under technical aid contracts. To exceed $1,000,000.

Commercial Buildings

RESIDENTIAL

BIDS ASKED

Calif., San Francisco—C. E. J. Rogers, archt., Phelan Bldg., taking bids 4 story basement, rein.-con., Ellis and Franklin Sts., for Bergene Realty Co., 323 Monadnock Bldg. $150,000.

N. J., Elizabeth—Orange Realty Co., 7 East Price St., Linden, taking bids general contract 5 story, basement, 75 x 145 ft., brick, steel, rein.-con., 8 Stiles St. $200,000. A. J. Silberstein, 7 East Price St., Linden, archt.

N. Y., New York—See "Contracts Awarded."

O., Berea (br. Cleveland) — W. J. Wefel, archt., 5716 Euclid Ave., Cleveland, taking bids two 6 story, basement, brick, steel, concrete, Rocky River Dr., for Berea Square Co., c/o G. F. Williams, Rockefeller Bldg., Cleveland. Est. $600,000.

CONTRACTS AWARDED

Calif., Berkeley—Interests represented by contractor, 3 story, basement, rein.-con., to H. Nelson, 3730 Atlas St., Oakland, $200,000.

Conn., South Norwalk—E. Hoyt, 10 Robinson Ave., Danbury, 3 story, basement, 65 x 82 ft., brick, cast stone, concrete apartment, store, to J. Lasprogate & Co., South Main St., Norwalk. Est. $125,000-$150,000. Noted Feb. 19.

N. Y., New York—Bing & Bing, 119 West 40th St., 16 story, Bleecker and Bank Sts., separate contracts. $400,000. Bids to be taken in late fall. Noted Apr. 24, 1930, under "Contracts Awarded."

N. Y., New York—Bing & Bing, 119 West 40th St., 40 story hotel, Central Park West and 106th St., separate contracts. To exceed $2,500,000. **Maturity late in fall.** E. Roth, 1440 Bway., archt. Noted Jan. 8, 1930.

N. Y., New York—General Realty & Utilities Co., 285 Madison Ave., 15 story, West End Ave., separate contracts. $500,000. Bids after Oct. 1. Private plans. Noted Jan. 15.

N. Y., New York—General Realty & Utilities Corp., 285 Madison Ave., 32 story apartment, Columbus Ave. and 67th St., separate contracts. $10,000,000. **Maturity in October.** Private plans. Noted Dec. 25, 1930.

CLUBS

PROPOSED WORK

Calif., San Francisco—Bohemian Club, Post and Taylor Sts., sketches by L. P. Hobart, Croocker Bldg. Class A club Taylor and Post Sts. $600,000.

Ill., Chicago—R. S. DeGoyler & Co., archts., 307 North Michigan Ave., soon lets contract 6 story, basement, rein.-con., brick club, 101 South Ashland Ave., for Y.W.C.A., 203 North Wabash Ave. $150,000. Noted Jan. 22.

Ind., Peru—Peru Miami Lodge of Masons, 167, Bway and 6th Sts., plans by A. M. Church, 231 East River St., brick, steel lodge. $150,000.

N. J., Passaic—Passaic City Club, Prospect St., 2 story, basement, brick, steel club house, Gregory Ave. $150,000. **Maturity probably soon.** Preiskel & Skvarla, 629 Main Ave., Passaic, probable archts.

N. J., Passaic—Clifton Lodge B.P.O.E., F. A. Latimer, exalted ruler, 725 Clifton Ave., plans by Lee & Hewitt, 152 Market St., Paterson, 2 story, basement, brick, steel addition, plain found., Clifton Ave. $150,000.

N. Y., Port Richmond (mail Staten Island) —Loyal Order of Moose, 110 Park Ave., 2 story, basement, club house, store, Park Ave. $150,000. **Maturity indefinite.** Architect not selected. Noted May 14.

O., Canton—Odd Fellows Assn., 100 x 200 ft., brick, or stone lodge, Cleveland Ave. $150,000. Architect not selected.

BIDS ASKED

N. J., Jersey City—J. F. Jackson, archt., 137 East 45th St., New York, bids about June 1, general contract 7 story, basement, 100 x 100 ft., brick, steel, rein.-con. addition, Fairview Ave., for Y. M. C. A., S. H. Lipscomb, genl. secy., 654 Bergen Ave. $300,000. Noted May 7.

N. J., Jersey City—A. Davis, archt., 140 Montgomery St., bids about June 1, general contract 2 story, basement, 50 x 100 ft., brick, steel, Liberty and St. Paul's Aves., for Polish American Democratic Club, 176 Pavonia Ave. $150,000. Noted May 14.

CONTRACTS AWARDED

Ont., Ottawa—Rideau Carling Co., Ltd., 76 Sparks St., brick, rein.-con., steel club house, plain found., Laurier Ave. W., to A. I. Garvock, Sparks St., $100,000. Artificial ice plant purchased.

HOSPITALS

PROPOSED WORK

Calif., Los Angeles—Angelus Hospital, 1925 Trinity St., sketches hospital units, incl. new research building, nurses home. $600,000.

Conn., Niantic — State, Seaside Sanatorium, Crescent Beach, infirmary, at Seaside Sanatorium, Crescent Beach. $150,000. Architect not selected.

Conn., Willimantic—Windham Co. Memorial Hospital, G. E. Taylor, chn. Building Com., receiving preliminary estimates 3 story nurses home, 3 story, basement hospital, incl. solariums, power plant and laundry, all brick, stone, West Main and Mansfield Sts. $500,000. Crow, Lewis & Wick, 200 5th Ave., New York, archts. C. S. Neergard, 512 5th Ave., New York, engr.

Mass., Watertown — Town, Bd. Selectmen, E. T. Fuller, sketches by C. P. Hoyt, 8 Beacon St., Boston, altering and constructing 2 story, basement, infirmary addition. $150,000 or more. Noted June 5.

Mo., Kansas City—State Psychopathic Hospital, c/o State Bd. Eleemosynary Institutions, sketches brick, concrete hospital. $150,000.

N. J., Browns Mills—Deborah Jewish Relief Society, M. M. Unger, chn. building com., 763 Broad St., Newark, 4 story, basement, sanitarium. $600,000. Bids in. Project in abeyance. Noted Apr. 9.

Vt., Waterbury—Vermont Hospital for Insane, E. A. Stanley, supt., men's ward. $150,000. Architect not selected.

Wis., Milwaukee—Columbia Hospital, 929 Maryland Ave., plans by Eschweiler & Eschweiler, 210 Mason Bldg., 5 story, basement addition, North Maryland Ave. $150,000.

Ont., Orillia—Dpt. P. Wks., Parliament Bldg., Toronto, 2 or 3 story, basement, concrete, brick, steel, stone hospital addition. $200,000. Noted May 21.

BIDS ASKED

Ind., Mt. Wayne—June 19, by Bd. Supervs. Illen Co., Byron Tuberculosis Sanitarium, 2 story, basement, rein.-con., brick, stone, Lima Rd., near here. $150,000. L. Bowers, 4631 South Wayne St., archt. Noted Apr. 9.

O., Cleveland—June 4, by City, D. S. Blossom, dir., 3 story, basement, 40 x 250 ft., brick, steel, concrete, tuberculosis sanitorium addition, Warrensville Farm. $250,000. H. Kregelius, 504 City Hall, archt. Noted Feb. 19.

Ore., Portland—Sutton & Whitney, archts., Lewis Bldg., bids about June 15, 4 story, basement, 49 x 75 ft. and 43 x 87 ft., brick, steel, 600 Commercial Ave., for Emanual Hospital, 600 Commercial St. $200,000. Noted Dec. 25.

CONTRACTS AWARDED

Conn., Norwich — State, Uncas-On-Thames, Old Senate Chamber State House, Hartford, nurses home and infirmaries, to Chas. Smith & Sons, 101 Main St., Derby, $353,000; brick employees building, incl. heating, plumbing, electrical work, to Pieretti Bros., Centerbrook, $114,000. Noted Apr. 30.

Kan., Lawrence—Kansas University, c/o State Bd. Administration, State House, Topeka, H. R. Rhodes, bus. mgr., Students Hospital, 3 story, part basement, sub-basement, concrete, brick, stone, to B. Green, Lawrence, $150,000. Noted Apr. 9.

Mass., Pittsfield—House of Mercy Hospital, 741 North St., 3 story, basement, 45 x 155 ft., brick, steel addition, to D. H. Pike, 30 Eagle St. Est. $150,000. Noted Apr. 2.

CHURCHES

PROPOSED WORK

Calif., Santa Barbara — First Church of Christ Scientist plans by H. H. Gutterson, 526 Powell St., San Francisco, 1 story, rein.-con., tile, steel church. $150,000.

Churches (Continued)

Ill., Peoria—Arcadia Presbyterian Church, 903 Bigelow St., revised plans by Hewitt, Emerson & Gregg, Peoria Life Bldg., 2 story, basement, 85 x 100 ft. church, Arcadia St. $200,000. Former bids rejected. Noted Oct. 30.

Mo., St. Louis—St. Anthony of Padua Roman Catholic Parish, B. Wewer, pastor, soon lets contract 3 and 4 story, basement, 104 x 190 ft., rein.-con., brick monastery, 3140 Meramec St. H. P. Hess, 1001 Ambassador Bldg., archt.

N. J., Glen Ridge—Guilbert & Betelle, archts., 20 Branford Pl., Newark, bids in June, general contract 2 story, basement, brick, steel church and Sunday school, for Glen Ridge Congregational Church, Ridgewood Ave. $250,000. Noted May 14.

N. J., Pleasantville—Epiphany Lutheran Church, E. A. Lebo, pastor, plans by E. A. Meas, Charlotte, N. C., 2 story, basement, brick, steel church, parish hall, Ansley Park, $150,000.

N. J., Raritan — St. Anns Roman Catholic Church plans by DePace & Juster, 151 West 42nd St., general contract 1 story, basement, 50 x 105 ft. brick, steel church. $150,000. Noted May 21.

N. J., Rutherford—Presbyterian Church, C. A. Ross, pastor, 80 Ridge Rd., 2 story, basement, brick, steel parish house, Ridge Rd. $150,000. **Maturity probably in June.** Architect not selected. Noted Feb. 19.

R. I., Warwick—Woodbury Union Church, B. K. Wilcox, chn. com., plans by E. E. Cull, 75 Westminster St., Providence, altering and constructing 2 story, basement, brick, stone addition, West Shore Rd. $150,000.

Que., St. Gerard Magelle — Roman Catholic Parish of St. Gerard, M. A. Darveau, curate, rebuilding church, recently destroyed by fire. Architect and engineer not selected.

BIDS ASKED

Mass., Pittsfield—St. Mark's Roman Catholic Society, J. M. Leonard, pastor, taking bids superstructure 1 story, 55 x 180 ft., granite, concrete, artificial stone, West St. $350,000. W. Donohue, 1200 Main St., Springfield, archt. Noted July 10.

Mass., Springfield — Union Congregational Church Society, c/o R. B. Warner, archt., 129 Ingersoll Ave., Dr., bids about June 1, 1 and 2 story, basement, brick stone church, parish house, plain found., Pine Point. $150,000 or more. Noted Apr. 2.

CONTRACTS AWARDED

Mass., Attleboro — St. John the Evangelist Roman Catholic Parish, J. Quinn, pastor, and Maginnis & Walsh, archts., Statler Bldg., Boston, 1 story, basement, 85 x 145 ft., granite, artificial stone church, to C. P. Maguire Co., 10 Weybosset St., Providence, R. I. Est. $200,000. Noted May 7.

N. J., East Orange—Fanning & Shaw, archts., 49 Ward St., Paterson, general contract 2 story, basement, 50 x 120 ft., brick, steel, Telford St. and Tremont Ave., to D. J. Cronin, 713 South Orange Ave., Newark, for St. Joseph's Roman Catholic Church, 218 Tremont Ave. Est. $150,000. Noted Apr. 30.

N. J., New Brunswick—P. L. Fowler, archt., 224 East Hanover St., Trenton, general contract 3 story, basement, brick, steel rectory to Rule Contr. & Repair Co., 383 George St., for Christ Episcopal Church, W. H. Stowe, pastor, 216 Lawrence St.; heating and plumbing, to Burns, Lane & Richardson, 301 Burnet St. Est. $150,000. Noted Apr. 20.

Que., Montreal—Church of St. Andrew and St. Paul (Presbyterian), A. Donald, minister, church, to Anglin-Norcross Ltd., 2063 Victoria St. $500,000.

SCHOOLS

PROPOSED WORK

Calif., Los Angeles—University of California, 3551 University Ave., plans by G. W. Kelham, 315 Montgomery St., San Francisco, two 1 story, steel, concrete men's and women's gymnasiums on campus. $1,000,000.

Conn., Suffield—Bd. Trustees Suffield School, sketches by James Gamble Rogers, 154 East 56th St., New York, school group, incl. dormitory, laboratory, class building, gymnasium, all brick, stone. $1,000,000. Noted July 3.

Conn., Wallingford—Town, School Com., H. M. Jefford, supt. schools, school. $300,000 bond issue authorized. Architect not selected. tric wiring, ventilating, etc.

Ga., Rome — Berry School, c/o M. Berry, pres., plans by Coolidge & Carlson, 89 State St., Boston, Mass., chapel and laundry buildings. $800,000.

Ind., East Chicago—School Comrs. plans by K. Norris, East Chicago, 2 story, basement, brick, steel grade and high school, 1610 East 140th St. $350,000.

Ind., Lafayette—School Comrs. plans by F. P. Beidel, Lafayette, brick, steel grade and high school, incl. auditorium. $150,000.

Me., Farmington—Town, W. L. Butler, chn. Building Comr., soon takes bids 2 story, basement, brick, stone school, plain found., Quebec St. $150,000. Coombs & Harriman, 11 Lisbon St., Lewiston, archts. Noted Apr. 30.

Md., Baltimore—Bd. Awards rejected bids May 6, West Baltimore Colored Elementary School, 3 story, basement, 96 x 135 ft., brick, structural steel concrete, Mount St. and Riggs Ave. Buckler & Fenhagen, 325 North Charles St., archts. H. Massart, 328 North Charles St., engr.

Mass., Burlington — Town, School Building Com., sketches by W. F. Holmes Co., 18 Newbury St., Boston, Junior and Senior High School, 2 story, basement, brick, stone, incl. auditorium, gymnasium, classrooms, plain found., Bedford and Cambridge Sts. $150,000-$160,000. Noted Feb. 19.

Mass., Falmouth—Town, P. Dillingham, supt. Schools, sketches by H. F. Kellogg, 378 Stuart St., Boston, Junior High School, 2 story, basement, brick, concrete. $175,000.

Mass., Groveland—Town, F. R. Hardy, building Comr., soon takes bids 2 story, basement, brick, stone high school, concrete found., Gravel Ridge. $150,000. H. L. Meacham Associates, 120 Front St., Worcester, archts. Noted Apr. 3.

Mass., Norfolk—Town, H. S. Mann, chn. Bd. Selectmen, grade school. $150,000 or more. Architect not selected.

Mass., Somerville (br. Boston)—City, School Building Comn., sketches by J. M. Gray and J. P. Hefferman, 175 High St., Boston, 2 story, basement, brick, stone, plain found., School St. $150,000—$200,000. Noted Jan. 8.

Mass., Springfield — City, School Bd., Z. E. Scott, supt. schools, plans by M. W. Maloney, 23 Pearl St., 2 story, basement, brick, steel, Haskin, Fisher and Lydia Sts. $150,000. Noted Apr. 30.

Mass., Swampscott—Town, H. S. Baldwin, chn. Building Com., plans by Cram & Ferguson, 248 Boylston St., Boston, 2 story, basement, irregular sized, brick, steel, limestone school, incl. library, gymnasium, domestic science and manual training, Forest Ave. $350,000. Noted Feb. 5.

Mass., Waltham — City, School Comn., sketches by McLaughlin & Burr, 88 Tremont St., Boston, altering and constructing 2 story, basement, brick, stone addition to Lawrence School, plain found., Trapelo Rd. $150,000. Noted May 21.

Mass., Waltham—City, Mayor's Office, City Hall, sketches by Fay, Spofford & Thorndike, 44 School St., Boston, 2 story, basement, brick, stone school, plain found., Appleton Park. $150,000 or more. Noted May 21.

Mass., Watertown—Rosary Academy, M. Victorine, superior, 130 Lexington St., plans by E. T. P. Graham, 171 Newbury St., Boston, 3 story, basement, 75 x 110 ft., brick, steel, boarding and day school, concrete found., Lexington St. $150,000 or more.

Mass., Wrentham—Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, plans by C. P. Hoyt, 8 Beacon St., Boston, and soon takes bids brick infirmary, at State School. $150,000 appropriated. Noted May 7.

N. J., Bayonne—Bd. Educ., City Hall, will not build 4 story, basement, brick, steel, technical high school, Avenue A. $300,000. D. Anderson, 718 Bway., Bayonne, archt. Noted Nov. 7.

N. J., East Orange—Bd. Educ., 19 Winan St., Junior High School, 2 story, basement, brick, steel, rein.-con., North Clinton St. and Renshaw Ave. $170,000. Project in abeyance. Architect not selected. Noted Apr. 2.

N. J., East Orange—Bd. Educ. will not build 2 story, basement, brick, steel school, Eastern Dist. $150,000. Project abandoned. Hacker & Hacker, 201 Main St., Fort Lee, archts. Noted Apr. 30.

N. J., Emerson—Bd. Educ. sketches 2 story, basement, brick, steel addition to Emerson School. $150,000.

N. H., Exeter—Phillips Exeter Academy, L. Berry, principal, plans by Cram & Ferguson, 248 Boylston St., Boston, and takes bids in June, brick, stone graduates building. $150,000.

N. J., Hasbrouck Heights—Bd. Educ., B. C. Wilcox, pres., Administration Bldg., sketches by E. Sibley, 1034 Edgewood Lane, Palisade, 2 story, basement, brick, steel, rein.-con., Franklin and Ravine Aves. $224,000.

N. J., Leonia—Bd. Educ., High School, revised sketches 2 story, basement, brick, steel high school addition, Christie Heights. $566,000. Noted Sept. 11 Daily.

N. J., Orange — Carteret Academy, 317 Carteret Pl., will not build 2 story, basement, brick, steel school, Orange St. $150,000. Project abandoned. Noted Feb. 19.

N. J., Paterson — Bd. Educ., City Hall, sketches by Fanning & Shaw, 49 Ward St., School 18, 2 story, basement, brick, steel, Riverside Sect. $150,000. Noted May 21.

N. J., Piscataway—Bd. Educ., for Piscataway town School, 2 story, basement, brick, steel. **Maturity in August.** A. Merchant, 1 Elm Row, New Brunswick, archt. Noted Apr. 20.

N. J., Plainfield—Bd. Educ., 119 West 9th St., 2 story brick, steel addition to McKinley School. $150,000. **Maturity probably soon.** Architect not selected.

N. J., Rahway—Bd. Educ., High School, sketches, 2 story brick, steel, Hamilton St. $250,000.

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Schools (Continued)

N. J., Trenton—Dpt. Institutions & Agencies, State House Annex, State School for Deaf, 2 story, basement, brick, steel, $150,000. **Maturity about September.** Guilbert & Betelle, 20 Branford Pl., Newark, archts. Noted Apr. 16.

N. J., Trenton—State Bd. Educ. plans by Guilbert & Betelle, 20 Branford Pl., Newark, gymnasium-classroom building, at State Teachers College, Hillwood Lakes. $250,000.

N. J., Union City—Bd. Educ., F. Ortel, secy., 415 32nd St., bids in July, 3 story, basement, brick, steel school, West St., between 5th and 6th Sts. $750,000. J. D. Lugosch, 714 Bergenline Ave., archt. Noted May 7.

N. J., West Orange—Bd. Educ., North Field Ave., Junior High School, 3 story, basement, brick, steel, rein.-con., Gilbert St. $550,000. **Maturity probably soon.**

N. Y., Williamsville — Bd. Educ. plans by Bley & Lyman, 505 Delaware Ave., Buffalo, high school addition, incl. gymnasium, manual training room, etc. $150,000. **Maturity about July.**

O., Euclid (br. Cleveland)—Notre Dame Convert, M. Evarista, Mother Superior, 1325 Ansel Rd., Cleveland, plans by T. D. McLaughlin and Associates, Lima, 4 story, 50 x 150 ft., brick, steel, concrete college addition, Green St. $150,000.

Pa., Arnold—Bd. Educ., C. L. Cotton, pres., plans by P. R. L. Hogner, Smithfield Bldg., Pittsburgh, brick high school, Woodmont St. $150,000.

Pa., Downingtown—Bd. Educ. plans by J. H. Mowers, Phoenixville, 2 story, basement, brick, steel high school, plain found., Harrison Pike. $160,000.

Pa., Glenshaw—Bd. School Directors, F. C. Koussman, pres., sketches steel, brick elementary and high school building, Shaler Twp., near here. $250,000. Architect not selected.

Pa., Monaca—Bd. Educ., I. R. Todd, pres., 1114 Atlantic Ave., plans by Stetson & Bradley, 719 Franklin Ave., Aliquippa, Junior High School, 2 story, basement, brick, tile, incl. gymnasium, wrecking old church building on site, Pennsylvania Ave. $150,000.

R. I., Providence — City, Dpt. P. Buildings, City Hall, soon takes bids 2 story, basement, brick, stone primary school, plain found., Paul and Windmill Sts. $150,000. T. J. H. Pierce, City Hall, archt. Noted Apr. 23.

Tex., College Station—**A. and M. College**, plans by A. & M. Drafting Dpt., College Station, 3 buildings (1 now under construction). Est. $600,000.

Wis., Beloit—Bd. Educ. sketches by Llewellyn & Llewellyn, 38 South Dearborn St., Chicago, Ill., high school addition. $500,000.

BIDS ASKED

Calif., Pasadena — California Institute of Technology taking bids two 3 story basement, 60 x 134 ft. and 100 x 125 ft., rein.-con. laboratory buildings. To exceed $150,000.

Calif., San Francisco—June 3, by S. J. Hester, secy. Bd. P. Wks., 2 story, basement, brick, steel, terra cotta addition to Girls High School, Scott and O'Farrell Sts., for City and San Francisco Co. To exceed $150,000.

Ind., Buckskin—June 2, by Bd. Comrs. Gibson Co., brick, steel, stone school. $150,000. Sutton & Routt, Citizens Trust Bldg., Vincennes, archt.

Mass., South Hadley — Town, School Bd., taking bids 2 story, basement, 35 x 45 ft. and 60 x 115 ft., brick, artificial stone school, Carew St. $150,000. M. Maloney, 23 Pearl St., Springfield, archt. Noted Mar. 19.

N. J., Bergenfield—Bd. Educ., C. S. Decker, dist. clk., 45 Smith Ave., bids about June 1, 2 story, basement, brick, steel, rein.-con., adjoining Marion Field. $155,000. A. Dore, 173 Main St., Hackensack, archt. Noted Apr. 9.

N. J., Long Branch—Bd. Educ., bids about June 1, 2 story, basement, brick, steel, rein.-con. school addition, Bway. $150,000. H. I. Braum, 501 Harrison St., archt. Noted May 7.

N. J., Morristown—Bd. Educ., O. M. Goble, dist. clk., 50 Early St., bids about Sept. 1, 2 story, basement, brick, steel, rein.-con., Mills St. $150,000. C. C. Voorhees, Schuyler Pl., archt. Noted May 21.

N. J., New Brunswick—Bd. Educ., Livingston Ave., bids about June 15, 2 story, basement addition to Senior High School, Livingston Ave. $250,000. A. Merchant, 1 Elm Row, archt. Noted Apr. 23.

Pa., Irwin—June 10, by Bd. Educ., C. Drake, pres., Elementary and Junior High School, 2 story, part basement, 186 ft. front, irregular sized, brick, steel, Chestnut St. $150,000. Hunter & Caldwell, 600 Central Trust Bldg., Altoona, archt.

Pa., Pottsville—Bd. Educ., c/o Secretary, bids about June 15, 3 and 4 story, basement, 246 x 401 ft. irregular sized, rein.-con., steel, brick, cut stone, terra cotta high school. W. B. Ittner, Inc., Continental Bldg., St. Louis, Mo., archts.

CONTRACTS AWARDED

Calif., Albany—Albany School Dist., general contract, rein.-con. school additions, to J. H. Johnson, Hearst Bldg., San Francisco, $104,500; electrical work, to Scott Butner Co., 19 Grand Ave., Oakland, $8,000; heating, to Scott Co., 113 10th St., Oakland, $13,975. Grand total $126,475. Noted Mar. 5.

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Conn., Middletown—State, C. Penniman, Lone Lane Farm, 3 brick cottage dormitories and superintendents cottage, to G. H. Birdseye, 2 Russell St., $117,357 and $13,788 respectively. Noted Apr. 16.

Kan., Hugoton — Bd. Educ., Dist. 3, Rural High School, 2 story, basement, 126 x 116 ft., brick, stone, to A. Helwig, Hoisington. Est. $150,000.

Ill., Kenilworth—Armstrong, Furst & Tilton, assoc. archts., 125 West Madison Ave., Chicago, general contract 4 story, brick high school addition, on campus, for New Trier High School, Winnetka, to J. W. Snyder & Co., 307 North Michigan Ave., Chicago. Est. $850,000.

Mich., Manistique—Bd. Educ., A. G. Reilly, secy., grade school, to Anderson Constr. Co., Manistee, $41,700; school, to Jensen & Campbell, Superior, $79,500, each 2 story, basement, brick, rein.-con., steel, plain founds.; steam heating for both schools, to L. J. Deming, Cadillac, $36,500. Grand total $157,700. Noted Apr. 16.

Mo., St. Joseph—Bd. Educ., A. L. Loring, secy., general contract Lindbergh School, 2 story, basement, brick, steel, rein.-con., to H. W. Underhill Constr. Co., 528 Medical Arts Bldg., Kansas City, $114,669; heating and plumbing, to Industrial Heating & Plumbing Co., 8th and Atchison Sts., $24,880; electrical work, to H. C. Korns Electric Co., 1725 Frederick St., $5,971. Grand total $145,520. Noted Apr. 30.

Mo., St. Louis—Bd. Educ., E. T. Friton, building comr., 911 Locust St., general contract J. G. Woerner School, 3 story, brick, concrete, stone, to M. I. Fleischer, 7310 Kingsbury Ave., $261,611; plumbing, to T. J. Sheehan Co., 2233 Olive St., $14,997; heating and ventilating, to Elliott & Barry Eng. Co., 4060 West Pine Blvd., $46,300; vacuum cleaning system, to Koppen-Smith Heating Co., 2628 Olive St., $3,104; electric lighting fixtures, to Rutler-Koahus, Inc., 2823 Olive St., $4,796; electrical work, to A. W. Van Nort, Railway Exch. Bldg., $12,930. Grand total $342,738. Noted May 7.

O., Bellefontaine — Bd. Educ., W. V. Scott, clk., Junior High School, 2 story, basement, brick, concrete, to C. L. Knowlton, Bellefontaine, $149,629; heating and plumbing, to T. C. Vanica Co., Bellefontaine, $42,391; electrical work, to Bidge Hardware Co., Bellefontaine, $13,485. Grand total $205,505.

THEATRES

PROPOSED WORK

Calif., Richmond—United Artists Corp. of California, 1066 South Vermont Ave., Los Angeles, plans by Walker & Eisen, Western Pacific Bldg., Los Angeles, Class A, steel, rein.-con. theatre, MacDonald Ave. $150,000.

N. H., Franklin—S. Kurson, 179 Exchange St., Bangor, Me., soon lets contract 1 and 2 story, 50 x 152 ft., brick theatre, Central St. $150,000. Bunker & Savage, 256 Water St., Augusta, Me., archts. Noted Apr. 30.

R. I., Providence—J. Conn, 368 Friendship St., plans by T. J. H. Pierce, 1713 New Industrial Trust Bldg., brick steel theatre, Chestnut and Broad Sts. $150,000 or more.

CONTRACTS AWARDED

Va., Charlottesville—Rapp & Rapp, archts., Paramount Bldg., New York, general contract theatre for Meyer & Engal, to D. J. Phipps Co., Roanoke. Paramount Publix Theatres, Inc., Paramount Bldg., New York, lessee. Noted Apr. 22.

BANKS

PROPOSED WORK

Mass., Newton—Newton Trust Co., F. L. Richardson, vice pres., 282 Washington St., bank, Auburn St., Auburndale Sect. $150,000 or more. Architect not selected.

OFFICES

PROPOSED WORK

Calif., Berkeley—Corporation being organized to finance plans by Hyman & Appleton, 68 Post St., San Francisco, Medico-Dental Building, 10 story, basement, Class A, Durant St. $300,000.

N. J., East Orange—Baldwin Constr. Co., 614 Central Ave., will not build 2 story, office, store, Central Ave. $175,000. Project abandoned. Noted Mar. 5.

N. J., Newark—F. A. Phelps, archt., 21 Fulton St., soon lets contract general contract 4 story, basement, brick, steel office, Washington Pl. and Halsey St., for Eagle Fire Insurance Co., 18 Washington Pl. $250,000. Noted Apr. 23.

N. Y., Stapleton—New York and Richmond Gas Co., 691 Bay St., St. George, sketches by Delano & Aldrich, 126 East 38th St., New York, office. $150,000. **Maturity indefinite.** Noted Apr. 9.

Tex., Tyler—Goldstein & Brown, plans by S. Simons, c/o Citizens Natl. Bank Bldg., 3 story (ultimately 8 story) basement, 60 x 120 ft., brick, rein.-con. office, store, plain found. $250,000.

CONTRACTS AWARDED

Conn., Hartford—Hartford Steam Boiler Inspection & Insurance Co., W. R. Corson, pres., Grove and Prospect St., brick, steel, concrete, insurance office building, plain found., to A. F. Peaslee, Inc., 15 Lewis St. Est. exceeds $150,000. Noted Mar. 5.

STORES

PROPOSED WORK

Mass., Brockton—F. W. Woolworth Co., 31 St. James Ave., Boston, plans by H. Grundman, 31 St. James Ave., Boston, 3 story, brick store, office, Main St. $125,000-$130,000. Noted Mar. 5.

N. J., Asbury Park—J. Ackerman, 404 Asbury Ave., will not build 2 story store, office, $150,000. Project abandoned. Noted Apr. 30.

N. J., Union City—S. Slatkin, 17 Oak St., Weehawken, revised sketches by P. L. Schultz, 256 Summit Ave., 3 story, basement, brick, steel store, office, 169-173 Summit Ave. $150,000. F. W. Woolworth Co., Woolworth Bldg., New York, lessee. Noted Apr. 9.

CONTRACTS AWARDED

Minn., St. Paul—R. N. Cardozo & Bros., Inc., 140 East 7th St., 11 story, basement, 80 x 100 ft., rein.-con., brick furniture store, storage, to Lindstrom & Anderson, 903 Builders Exch. Bldg. Est. $300,000. Noted Apr. 17, 1930.

PUBLIC

PROPOSED WORK

Conn., Litchfield — JAIL — Comrs. Litchfield Co., J. H. Lancaster, secy., sketches by P. Sunderland, 248 Main St., Danbury, brick, steel jail. $200,000. Noted May 14.

N. J., Metuchen — LIBRARY — Bd. Trustees Free Public Library, will not build 2 story, basement, brick, steel library. $150,000. Project abandoned. Noted Apr. 30.

N. J., Englewood—MUNICIPAL—Bd. City Council, Municipal Bldg., will not alter 2 story, basement, brick, steel Liberty School into municipal building, Liberty St. $150,000. Project abandoned. Noted Mar. 12.

N. J., Perth Amboy—FIRE HOUSE—Bd. City Comrs., City Hall, 3 story, basement, brick, steel. $150,000. Project in abeyance. Greisen & Turzik, 175 Smith St., archts. Noted Apr. 30.

N. D., Devils Lake—MEMORIAL and COURT HOUSE—Ramsey Co., J. O. Peterson, aud., plans by J. W. Marshall, Devils Lake, and N. W. Fisher, St. Mary's Bldg., St. Cloud, Minn., 3 story, basement, brick, stone, rein.-con. $350,000. Will probably vote in June on $190,000 bond issue for same.

R. I., Providence—FIRE STATION—City, Dpt. P. Buildings, soon takes bids 2 story, basement, brick, concrete, steel, Reservoir Ave. and Roger Williams Park. $150,000. T. J. H. Pierce, City Hall, archt. Noted Mar. 19.

S. D., Pierre — CAPITOL — State, Capitol Bldg. Comm., plans by Perkins & McWayne, Sioux Falls, office building, 22,000 to 32,000 sq.ft. floor space, $285,000. Noted Apr. 2.

Tex., Brownsville—AUDITORIUM—City, c/o R. B. Renfro, mayor, plans by W. D. D. Van Siclen, Maltby Bldg., 2 story, hollow tile, rein.-con., stucco, 60,000 sq.ft. floor space, plain found. $100,000-$150,000 election soon for same. Noted May 14.

Canada — GOVERNMENT — Dpt. P. Wks., Parliament Bldgs., Ottawa, Ont., expending $2,200 for government building at Atholville, $5,000 at Forest City, $75,000 at Moncton, $52,000 at Dalhousie, $30,000 at McAdam, and $10,000 at St. John, all foregoing in New Brunswick Province; $30,000 at Asbestos, $12,000 at Beauport, $4,000 at Grande Mere (under contract), $21,000 at Hull, $3,500 at Beauharnois (under contract), $12,000 at Beeke, $6,500 at Grosse Isle, $45,000 at Huntingdon, $8,000 at Jonquiere, $25,000 at Maisonneuve, $17,000 at Quebec, $17,000 at Ste. Martine, $39,500 at St. Anne de Bellevue, $6,000 at St. Hyacinthe (under contract), $4,500 at Shawinigan Falls (under contract), $22,500 at Trout River, $14,500 at Victoriaville (under contract), $6,600 at Ville Marie (under contract), $120,000 general improvements at various centers, $145,000 for postal station in Notre Dame de Grace, $500,000 for postal terminal building, $1,200 for postal drop improvements all at Montreal, all foregoing in Quebec Province. K. M. Cameron, Parliament Bldgs., Ottawa, Ont., ch. engr.

BIDS ASKED

Mass., Walpole — MEMORIAL — June 1, by Town, H. W. Caldwell, chn. Building Com., brick, stone. $150,000. Putnam & Cox, 114 State St., Boston, archts. Noted Apr. 9.

Mass., Worcester—AUDITORIUM—June 22, by City, Worcester Memorial Auditorium, Superintendent Pub. Buildings, City Hall, brick, stone, steel, Salisbury St. $2,000,000. L. W. Briggs & Co., 314 Main St., archts. F. C. Hirons, 40 East 49th St., New York, assoc. archt. Noted May 7.

N. J., Caldwell—BORO HALL—Bd. Boro Council bids about June 1, 2 story, basement boro hall. $175,000. Guilbert & Betelle, 20 Branford Pl., Newark, archts. Noted May 14.

N. J., Elizabeth—COURT HOUSE—June 8, by Bd. Freeholders Union Co., Court House, taking bids general contract masonry, carpentry, plumbing, sheet metal work, jail equipment work, steel, iron, heating, ventilating, electrical work and elevators, altering and constructing 15 story, basement, brick, steel court house addition, Broad St. and Rahway Ave. $1,000,000. Oakley & Son, 1259 Clinton Pl., archts. P. West, 13 Central Ave., Newark, engr. Noted Apr. 9.

N. J., Hackensack—ADMINISTRATION—July 3, by Bd. Freeholders Bergen Co., Court House,

Public (Continued)

4 story, basement, brick, steel, rein.-con., Main and Hudson Sts. $1,200,000. Tilton, Schwanewede & Githens, 420 Lexington Ave., New York, archts. Noted May 7.

CONTRACTS AWARDED

Ark., Russellville — COURT HOUSE — Bd. Comrs. Pope Co., c/o H. M. Spaulding, clk., 4 story, basement, 70 x 112 ft., concrete, brick, stone, to J. H. Riddick, Kennedy Bldg., Ft. Smith, $150,000. Noted Mar. 12.

Ark., Texarkana—JAIL—Miller Co., 5 story, rein.-con., brick, steel, Broad and Laurel Sts., to Oats Building & Constr. Co., Texarkana. $135,760. Noted Apr. 9.

N. Y., Dannemora—CELL BLOCK—Dpt. Correction, State Office Bldg., Albany, general contract east cell block laundry and bath building Clinton Prison to Boyajohn & Barr, 299 South Front St., Columbus, O., $781,729; heating, to Levine Plumbing & Heating Co., 520 East 11th St., New York, $61,160; sanitary work, to Bresnaham Co., 59 East Ferry St., Buffalo, $84,446; electrical work, to F. J. Francis, Inc., 111 Ford St., Ogdensburg, $27,000. Grand total $954,335. Noted Apr. 2.

UNCLASSIFIED

PROPOSED WORK

N. H., Manchester—HISTORICAL—Manchester Historical Society, F. B. Carpenter, pres., soon lets contract 2 story, basement, 90 x 100 ft., brick, limestone, stone found., Amherst St. $150,000. Noted Oct. 31, 1929.

Ont., Ottawa—LEGATION — French Govt. plans by C. A. Henry, minister to Canada, Ottawa, legation office and residence. $200,000.

CONTRACTS AWARDED

Ill., Peoria—BUS DEPOT, MARKET, etc.—Corporation, c/o M. Allithorpe, Block & Kuhl, 5 story (ultimately 11 story), basement, 100 x 130 ft. bus depot, vegetable market, 300 car ramp garage, Washington St., to V. Jobst & Son, Lehman Bldg. Est. $450,000.

N. J., Newark—FARMERS MARKET—Newark Farmers Market, Inc., G. Haines, vice pres., 1218 Broad St., Bloomfield, general contract fifty 1 story, basement, brick, steel buildings, to F. D. Trainor & Sons, Inc., 12 Smith St., Irvington. Est. $150,000. Noted May 21.

Industrial Buildings

FACTORIES AND MILLS

PROPOSED WORK

Calif., San Francisco—OIL STORAGE and DISTRIBUTION PLANT — General Petroleum Corp. of California, 310 Sansome St., postponed indefinitely storage and distributing plant, North Beach Dist. Noted Sept. 25, 1930.

Mass., Everett—PLANT—Merrimac Chemical Co., Chemical Lane, soon lets contract brick, steel, bi-sulphite plant. Chemical Lane. $40,000. Private plans.

Mass., Taunton—MANUFACTURING—Taunton Pearl Wks., 35 Vernon St., revised plans by Jackson & Moreland, Park Sq. Bldg., Boston, 2 story, basement, brick, timber manufacturing buildings. $50,000. Former bids rejected. Noted Mar. 12.

Minn., Minneapolis — BLENDING PLANT — See "Unclassified."

N. J., Edgewater—PLANT— Lever Bros., 370 7th Ave., New York, and Cambridge, Mass., sketches by Stone & Webster, engrs. and archts., 210 Bway., New York, remodeling 4 story, basement, brick, steel, River Rd. To exceed $40,000.

N. J., Newark—FACTORY—Unique Art Mfg. Co., 196 Waverly Ave., 2 story, basement, brick, steel, Waverly Ave. $100,000. Project in abeyance. S. Shaw & Co., 24 Commerce St., archts. Noted May 7.

N. J., New Brunswick — FACTORY — Aplo Clothing Co., Remsen Ave., plans by H. G. Bach, 63 Schureman St., 3 story, basement, 75 x 200 ft., brick, steel, rein.-con. addition, Remsen Ave. $125,000.

N. J., Roselle—FACTORY—Roselle Frocks, Inc., 1107 Chandler Ave., plans by J. Anderson, 251 North Broad St., Elizabeth, 2 story, basement, 80 x 100 ft., brick, steel, Chandler Ave. $40,000. Noted May 21.

N. Y., New York—LIGHT MANUFACTURING—H. C. Young, 37 Murray St., will award general contract in June, altering light manufacturing plant and workshop, 37 Murray St. $40,000. Bids in. J. Fisher, 45 Astor Pl., archt. Noted Feb. 19.

O., Salem — FURNACE — Mullins Mfg. Co. soon takes bids new continuous electric porcelain enameling furnace, new press equipment, sand ballasting units, mill equipment for enameling, complete conveyor apparatus for production line and various welding devices, Depot St. $175,000.

Pa., Titusville — DAIRY — Titusville Dairy Products Co., H. Rabild, pres. and mgr., South Washington St., plans by Braziell & Anderson, 309 4th Ave., Pittsburgh, 1 and 2 story, brick, steel, concrete, South Washington St. $50,000.

Ont., Consecon—GRIST MILL—J. James grist mill. $50,000.

Ont., Hamilton—MANUFACTURING PLANT, etc.—Anchor Cap & Closure Co., 22 Queen's Blvd., Long Island City, N. Y., A. Stewart, in charge, or J. O. Deegan, 275 Wallace Ave., Toronto, manufacturing plant, harbor development. Project abandoned. Noted Apr. 16.

Ont., Toronto—Deer Park United Church, St. Clair Ave. W., plans by A. M. Brydon, 62 Duggan Ave., altering and constructing 1 and 2 story, basement, brick, stone, brick church and new Sunday School building. $150,000.
Steam heating and electric wiring.

BIDS ASKED

O., Cleveland—FACTORY, etc.—Amer. Multigraph Co., J. E. Rodgers, pres., 1814 East 40th St., taking bids 1 story, 580 x 620 ft., brick, steel factory, 3 story, brick, steel, concrete, office, 60,000 sq.ft. floor space, 1 story power plant, 650 hp., Babbitt Rd. $1,000,000. E. McGeorge, Midland Bank Bldg., archt. and engr. Noted Apr. 23.

O., Cleveland—STEEL MILL—Otis Steel Co., L. C. Parrott, purch. agt., 3341 Jennings Rd., taking bids on found. and sides, 1 story, 100 x 400 ft. and 90 x 240 ft., steel, concrete, brick, 601 Clark Ave. Est. $250,000. Structural steel, awarded to Amer. Bridge Co., Rockfeller Bldg.

Pa., Erie—PLANING MILL and LUMBER YARD—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Redwood City—ICE MANUFACTURING PLANT—Union Ice Co., 354 Pipe St., San Francisco, 1 story, 100 x 126 ft. concrete, to W. W. Williamson, 320 Market St., San Francisco. Noted Apr. 16.

Conn., Bridgeport—PLANT—Jenkins Valve Co., 510 Main St., 1 story, 65 x 65 ft., brick, steel, concrete plant addition, to Hewlett Co., 886 Main St. Est. exceeds $40,000, incl. equipment. Noted May 21.

O., Cleveland—PACKING PLANT—Cleveland Provision Co., H. A. Schantz, pres., 2527 Canal Rd., 2 story, basement, 88 x 110 brick, steel, concrete, 3378 West 65th St., to A. A. Lane Constr. Co., 1873 East 55th St. Est. $150,000. Noted Sept. 4.

O., Cleveland—FACTORY—Lempco Products, Inc., J. F. Strand, pres., Dunham Rd., 1 story, 70 x 160 ft., brick, steel addition, to C. Hanacek, 4121 East 135th St. Est. $100,000.

O., Cleveland — STEEL MILL — See "Bids Asked."

O., Sandusky—PACKING PLANT—Anders & Reimers, archts. and engrs., Columbia Bldg., Cleveland, 2 story, brick, steel, concrete, to

Pa., Erie—PLANING MILL and LUMBER YARD—J. Quirk, 906 East 11th St., rebuilding mill and lumber yard, 900 Block East 11th St., recently destroyed by fire, own forces. **Maturity probably in June.**

Tex., Beaumont—BOTTLING PLANT—Coca Cola Bottling Co., 560 Edgewood Ave. N. E., Atlanta, Ga., general contract 2 story, basement, 71 x 130 ft., brick, tile main building, 1 story, L-shaped, 30 x 130 ft. garage and 30 x 159 ft. annex, plain founds., to Christy-Dolph & Collins, 902 Goodhue Bldg., $73,000. Noted Mar. 12, under "Contracts Awarded."

Ont., Willow Grove — PLASTER MILL — Canadian Gypsum Co., H. O. 1221 Bay St., Toronto, 56 x 300 ft., sheet rock building, 50 x 156 ft. mill, 40 x 42 ft. machine shop, 50 x 175 ft. warehouse, all foregoing 1 story, steel, tile, curtain walls, to W. H. Cooper, Lister Bldg., Hamilton. Noted Apr. 30.

GARAGES

PROPOSED WORK

N. Y., Brooklyn—Wooster Lumber Co., service garage, Avenue S and Lake St. $40,000. **Maturity late in August.** W. Richter, 301 Elmwood Ave., archt. Noted May 14.

BIDS ASKED

Pa., Mt. Jewett — June 1, by Johnson & Keesler, 1 story, 50 x 50 ft., brick garage and service station. $40,000. Private plans.

CONTRACTS AWARDED

Ill., Peoria—See "Buildings—Unclassified."

Mo., St. Louis—Loose-Wiles Biscuit Co., 120 South 15th St., general contract 1 story, 60 x 180 ft., concrete, brick, steel garage, 14th St. north of Clark Ave., to Baerveldt & Honig, 624 Wainwright Bldg.

Mo., St. Louis — St. Louis Dairy Co., 2000 Pine St., 2 story, 80 x 120 in., rein.-con., brick, steel top addition, 2203 Eugenia St., to Fruin-Colnon Contg. Co., Merchants-Laclede Bldg.

SHOPS AND FOUNDRIES

PROPOSED WORK

Mass., Belchertown—INDUSTRIAL SHOP—Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, plans by Kendall, Taylor & Co., 209 Columbus Ave., Boston, brick, steel, at State School. $50,000. R. D. Kimball Co., 6 Beacon St., Boston, engrs.

BIDS ASKED

N. Y., Long Island City—SHOP—June 2, by Dpt. Water Supply, Gas & Electricity, Municipal Bldg., New York, building for headquarters 1st Ward Repair Company, Dryer Ave. between Packard and Bliss Sts.; also steam piping and appurtenances for high service boiler in east boiler room, Millburn Pumping Station, Baldwin, both Queens Boro. Noted Apr. 23.

CONTRACTS AWARDED

N. J., East Rutherford—REPAIR SHOP, etc.—Craig Coal Co., 10 Park Ave., general contract, 2 story, basement, 50 x 120 ft., brick, steel repair shop, garage, office, plain found., to H. Hensch & Son, 602 2nd St., Carlstadt. Est. $40,000. Noted Apr. 16.

POWER PLANTS

PROPOSED WORK

Mont., Harve—Great Northern Ry. Co., J. R. W. Davis, ch. engr., 1215 Railroad Bldg., St. Paul, Minn., plans by T. D. McMahon, 1215 Railroad Bldg., St. Paul, rein.-con., brick power plant. $100,000.

Texas — Central Power & Light Co., Alamo Natl. Bank Commerce Bldg., San Antonio, purchased Arkansas-Rockport Light, Ice & Power Co's. electric and ice properties at Aransas Pass, Ingleside, Rockport, Fulton, and Bayside, and plan surveys, considerable improvements, incl. enlargements, new machinery, equipment. Private plans.

B. C., Brilliant—West Kootenay Power & Light Co., Ltd., Rossland, made application to Water Rights Branch at Victoria, for 30,000 hp. development on Kootenay River. $4,000,000. L. A. Campbell, c/o owners, Rossland, engr.

CONTRACTS AWARDED

Ind., Auburn—School Comrs., general contract 2 story, basement, steel, brick power plant, water supply service, hot water heater, to A. C. Achmier, Auburn. Est. $50,000. Noted Apr. 9.

Ind., Ft. Wayne — Bd. Directors Indiana School for Feeble Minded, Black Hawk Farm, Hicksville Rd., brick, steel power plant, to Buesching & Hagerman Co., 402 East Superior St. Est. $195,000. Noted Apr. 9.

Mass., Boston—Edison Electric Illuminating Co., 39 Boylston St., Boston, 1 story, brick, rein.-con., steam heating plant addition, concrete found., to W. A. and H. A. Root Co., 250 Stuart St. Est. $750,000. Noted Apr. 9.

WAREHOUSES

PROPOSED WORK

Calif., Oakland — Quaker State Oil Refining Co., 654 East 60th St., J. E. McCormick, in charge, sketches storage and distribution plant, East 12th St. To exceed $100,000.

N. J., Newark—Voorhees, Gmelin & Walker, archts., 101 Park Ave., New York, bids after June 1, general contract 6 story, basement, brick, steel, rein.-con. warehouse, garage, Loretta Ave. and Fabyan Pl., for New Jersey Bell Telephone Co., 540 Broad St. $750,000. Noted Apr. 16.

N. Y., Buffalo—Great Atlantic & Pacific Tea Co., 420 Lexington Ave., New York, A. Burlingame, in charge, warehouse, food packing plant addition, probably rein.-con. Hamburg St. To exceed $40,000.

Pa., Pittsburgh—Iron City Oil Corp., W. A. Rodgers, vice pres. and mgr., 6800 Kelly St., sketches by C. P. Pellegrini, 205 North Highland Ave., concrete warehouse and loading plant.

Ont., Clarksburg—Georgian Bay Fruit Growers soon let contract 1 story, 70 x 70 ft., concrete cold storage and fruit packing plant, incl. special insulation, refrigeration equipment. E. H. Darling, Piggott Bldg., Hamilton, engr.

Ont., Thedford—J. K. Laehn, engr., 129 King St., West Kitchener, cold storage plant. $100,000.

BIDS ASKED

N. Y., Willard—June 10, by Dpt. Mental Hygiene, State Office Bldg., Albany, refrigeration park, enlarging cold storage and ice making plant, Willard State Hospital; adv. E. N.-R. May 28.

CONTRACTS AWARDED

Calif., Oakland—City of Oakland Port Comn., 424 Oakland Bank Bldg., general contract Warehouse AA, 1 story, 100 x 518 ft., steel, to H. J. Christiansen, Ray Bldg., $70,975; structural steel, to Herrick Iron Wks., 18th and Campbell Sts., $12,870. Noted Apr. 30.

Calif., San Francisco—San Francisco Packing Co., Phelps and Williams Sts., 1 story, concrete warehouse, Phelps St., to Cahill Bros., 206 Sansome St., $40,000.

Mass., Jamaica Plain—Boston Consolidated Gas Co., 250 Stuart St., Boston, 5 story, brick, rein.-con. warehouse, garage, service building, plain found., to Rust Eng. Co., Koppers Bldg., Pittsburgh, Pa. Est. $50,000 or more. Noted Apr. 2.

Pa., Washington—Bloch Bros. Tobacco Co., S. P. Morrow, in charge, 4030 Water St., 1 story, 56 ft. high, 88 x 460 ft., rein.-con., concrete, steel, tile, Canton Twp., to J. L. Ernest, 1107 Market St., Wheeling, W. Va. Noted May 7.

Ont., Picton—Prince Edward County Fruit Growers, general contract 3 story, basement, 94 x 172 ft., rein.-con., storage building, to J. Stacey, Quinte St., Trenton. Est. $100,000. Noted May 14.

Que., Montreal—Pesner & Bros. Ltd., 65 x 70 ft., brick, steel warehouse, Inspector St., to J. Gilletz & Co., 4392 City Hall Ave. Est. $50,000.

See proposal advertising on page 79

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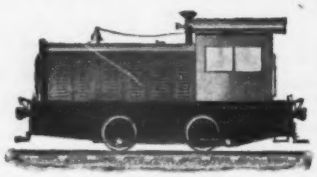

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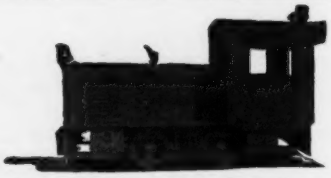

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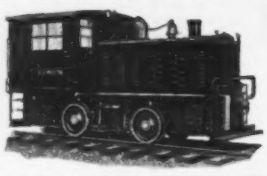

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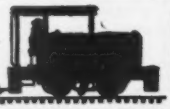

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